PROGRAM BOOK

SHM&ES 2025

The 4th international conference on

Structural Health Monitoring and Engineering Structures

August 7-8, 2025, Nha Trang City, Vietnam

The SHM&ES 2025 theme is
"Advancements in Sustainable Engineering and Management: Innovations for Reducing Energy Consumption and Carbon Footprint"

Organized by

Ho Chi Minh City Open University, Viet Nam

TRƯỜNG ĐẠI HỌC MỞ TP. HỒ CHÍ MINH
HO CHI MINH CITY OPEN UNIVERSITY

CEATS
TECHNOLOGY CREATES FUTURE

DIAMOND SPONSORS

PHỐ THỊ

GOLD SPONSORS

GREEN DRAGON SOLUTION

MYDA ENGINEERING & CONSTRUCTION

DT.

SILVER SPONSORS

SAIGON IC Instrument - Construction

ĐẠI ĐỒNG TÂM

CO - SPONSORS

REATTEC

KHAIPHAT

LIEN VIET GROUP

LIEN VIET

ANH QUỐC SG

GEOSCAN

Brandsketer Viet Nam
Max Your Brand

The fourth International Conference on Structural Health Monitoring & Engineering Structures (SHM&ES 2025)

August 7-8, 2025, in Nha Trang, Vietnam

"Advancements in Sustainable Engineering and Management: Innovations for Reducing Energy Consumption and Carbon Footprint"

Organized by

TRƯỜNG ĐẠI HỌC MỞ TP. HỒ CHÍ MINH
HO CHI MINH CITY OPEN UNIVERSITY

THE CONTENT

ABOUT US

TRƯỜNG ĐẠI HỌC MỞ TP. HỒ CHÍ MINH
HO CHI MINH CITY OPEN UNIVERSITY

CEATS
TECHNOLOGY CREATE FUTURE

CENTER FOR ENGINEERING APPLICATION AND TECHNOLOGY SOLUTIONS

Ho Chi Minh City Open University

Ho Chi Minh City Open University (HCMCOU) was founded on July 26th, 1993, according to the Decision 389/Ttg signed by the Prime Minister on the foundation of Ho Chi Minh City Institute of Open Education established on June 15th, 1990, according to the Decision 451/Ttg signed by the Minister of Education and Training. HCMCOU is the first institution to offer an open training with the aim of implementing the directions of the Communist Party and Government in socializing education and multiplying training types.

HCMCOU is a higher education institution offering a variety of programs ranging from on-site to distance learning and learning at satellite academic centers, it aims to meet various learning needs of society and to contribute enriching the country's human resources.

There are currently more than 32,000 students enrolling in daytime, nighttime, and distance-learning courses at HCMCOU. The university has, thus far, granted approximately 31,000 bachelor's degrees and more than 1,000 master's degrees. Further details can be found at https://ou.edu.vn/

35 YEARS ANNIVERSARY

Center for Engineering Application and Technology Solutions (CEATS)

Becoming a professional center for scientific research, training, and exchanging high-class technology in construction and infrastructure fields in Vietnam and in the region.

Working towards in-depth and highly applicable research, finding advanced solutions for structural analysis and assessment, in order to contribute into the general development of Vietnam, also the growth of world-wide science and technology.

We are an organization founded with engineers and researchers who have acquired extensive experience and expertise in structural analysis, engineering optimization, artificial intelligence, finite element method, structural health monitoring and simulation. Furthermore, we have been expanding our work internationally by cooperating with scientists, editors in chiefs of international journals and experts around the world including Belgium, France, Italy, Germany, Singapore and so on. Further details can be found at https://ceats.ou.edu.vn/us/

WELCOME MESSAGE

Prof. Nguyen Minh Ha

President of Ho Chi Minh City Open University

Viet Nam

Dear Friends and Colleagues,

On behalf of the President of Ho Chi Minh City Open University, I would like to extend our warmest thanks for your presence at the 4th International Conference on Structural Health Monitoring & Engineering Structures (SHM&ES 2025), held on August 7–8, 2025, in the beautiful coastal city of Nha Trang, Vietnam.

The theme of SHM&ES 2025 is: "Advancements in Sustainable Engineering and Management: Innovations for Reducing Energy Consumption and Carbon Footprint."

This theme highlights the critical role our field plays in addressing today's global challenges—particularly the need for environmentally responsible engineering solutions that promote resilience, efficiency, and sustainability. The conference aims to bring together leading researchers, engineers, and professionals from academia and industry to share new insights, developments, and applications related to structural health monitoring and engineering structures. Topics include theoretical models, numerical simulations, experimental studies, and real-world industrial applications. One of our key goals is to encourage international collaboration across disciplines and institutions.

I would like to express my sincere gratitude to the conference chairs for their dedication and hard work in ensuring the success of this event, and to the scientific committees for their valuable contributions to the program.

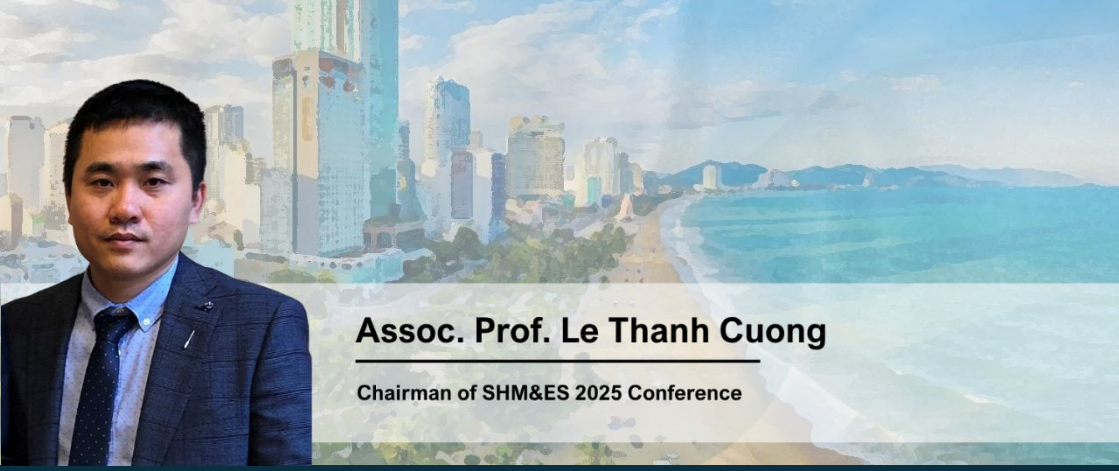
My special thanks go to the keynote speakers:

- Prof. Nicholas Fantuzzi: Professor at the University of Bologna, Italy, and Editor-in-Chief of the journal Composite Structures.
- Prof. Chan Ghee Koh: Director (Research) of the Coastal Protection & Flood Resilience Institute, and Director of the Centre for Hazards Research at the National University of Singapore.

Many thanks to all sponsors for their funding support for SHM&ES2025 conference. I would also like to thank the presenters for arranging their time and making their way to present their research findings to us. Without them, none of the sessions at this Conference would be possible.

Finally, I would like to thank you for your attendance and participation and encourage you to make the most by fully engaging in the networking and learning opportunities this SHM&ES2025 Conference presents.

Thank you, and all the best to you all.



Assoc. Prof. Le Thanh Cuong

Chairman of SHM&ES 2025 Conference

Dear Friends and Colleagues,

On behalf of the Organizing Committee, it is our great pleasure to welcome you to the 4th International Conference on Structural Health Monitoring & Engineering Structures (SHM&ES 2025), taking place on August 7–8, 2025, in the beautiful coastal city of Nha Trang, Vietnam. This conference is proudly hosted by Ho Chi Minh City Open University and the Center for Engineering Application and Technology Solutions.

SHM&ES 2025 aims to bring together leading scientists, engineers, and industry professionals from around the world to share and explore the latest advancements in structural health monitoring (SHM) and engineering structures, with a special focus on sustainability. Key topics include innovative structural designs aimed at reducing energy consumption and CO_2 emissions, cutting-edge techniques for structural damage detection, and practical applications across industrial engineering. The conference also highlights theoretical developments, numerical simulations, and experimental methodologies. Importantly, discussions will also address sustainability management strategies, emphasizing how engineering practices can align with environmental and social responsibilities.

We are honored to welcome distinguished keynote speakers who are internationally recognized experts in the field:

- Prof. Nicholas Fantuzzi, Professor at the University of Bologna, Italy, and Editor-in-Chief of Composite Structures.
- Prof. Chan Ghee Koh, Director (Research) of the Coastal Protection & Flood Resilience Institute and Director of the Centre for Hazards Research at the National University of Singapore.

We also extend our sincere appreciation to all the presenters who have dedicated their time and effort to share their research with us.

This year, we received an impressive response: over 300 abstracts and 250 full-length papers from authors across the globe. After a rigorous review process, 120 papers have been accepted for presentation and will be published in our conference proceedings under Lecture Notes in Civil Engineering (indexed in Scopus).

We hope SHM&ES 2025 provides you with a valuable and enriching experience, and that you enjoy your time in Nha Trang City, Vietnam.

Warm regards,

The SHM&ES 2025 Organizing Committee

KEYNOTE SPEAKERS

Prof. Nicholas Fantuzzi

Prof. Fantuzzi is currently a professor at the University of Bologna, Bologna, Italy. He is also the Editor-in-Chief of the journal Composite Structures

Title: **Enhancing Structural Integrity for Decarbonisation in Offshore Marine Environments**

Abstract: Advancing decarbonisation within the offshore sector necessitates a thorough comprehension of structural integrity under the harsh marine conditions. This presentation addresses pivotal challenges and innovative methodologies essential to achieving this goal.

Key fatigue design issues linked to reusing transition pieces from decommissioned platforms for offshore wind energy applications are examined, underlining the demand for novel engineering solutions. Additionally, the fatigue damage assessment of jacket-type platforms is analyzed, employing global methodologies and stochastic techniques with wave spectrum data to improve prediction accuracy. Detailed stress concentration factor assessments and fatigue life evaluations of offshore tubular KT-joints further emphasize the critical factors influencing structural durability in marine settings.

The presentation also explores the role of digital twin technology in the decommissioning process, promoting sustainable reuse by repurposing decommissioned jacket platforms as wind turbine foundations. A global fatigue assessment framework is proposed for these platforms, facilitating their transformation into offshore wind infrastructure.

These findings offer valuable insights into supporting decarbonisation initiatives in the offshore sector, while prioritizing the safety and longevity of marine structures.

Prof. Chan Ghee Koh

Prof. Chan Ghee Koh is currently the Director (Research) of the Coastal Protection & Flood Resilience Institute and the Director of the Centre for Hazards Research at the National University of Singapore. He has served on editorial boards of many journals, including Journal of Structural Health Monitoring (based in USA)

Title: **Detection of Train Wheel Flats Using Rail Pad Sensor and Model-Based Identification Algorithm**

Abstract: "Wheel flat" occurs when a wheel stops rotating while the train is moving, for example, due to emergency braking or slippery conditions. Early detection of wheel flats is important to reduce vibrations and damage of components caused by impact of wheel flats on rails. Nevertheless, it is challenging to quantify the wheel-flat size without interrupting railway operations. This keynote presentation will cover a novel methodology that combines a new sensor technology with an advanced identification algorithm to achieve this goal. (1) Sensor: An innovative rail pad sensor is proposed by surface bonding a thin multilayered sensing device beneath the rail pad for train wheel load identification. The low-cost sensor shows good linearity within the load regime tested and performs well under dynamic loadings. It does not have blind-zone problem, which is one advantage over the conventional strain gauge-based wheel load monitoring system. (2) Algorithm: A model-based identification algorithm is proposed to quantify the size of wheel flats with real time data, accounting for modeling and measurement uncertainties. By using a two-step important-point-selection approach in the time series data interpretation, the proposed algorithm extracts perceptually important points that align with the human visual identification process to represent the time series shape. These points are then further filtered using joint entropy as an information-gain metric. The proposed identification methodology has been successfully applied to a field test in which the identified flat sizes agree with the observed range of true values.

CONFERENCE SCHEDULE

DAY 1 – THURSDAY MORNING, AUGUST 07, 2025

Plenary Section

Time	Activity (Grand Ball room – 3rd floor)	Speakers
08:10 – 08:15	Welcome show	
08:15 – 08:25	Opening Conference	Prof. Nguyen Minh Ha
08:25 – 08:30	Welcome message	Assoc. Prof. Le Thanh Cuong
08:30 – 09:00	**Plenary lecture 1**: Enhancing Structural Integrity for Decarbonisation in Offshore Marine Environments	Prof. Nicholas Fantuzzi (Chair by Dr. Samir Khatir)
09:00 – 09:30	**Plenary lecture 2**: Detection of Train Wheel Flats Using Rail Pad Sensor and Model-Based Identification Algorithm	Prof. Chan Ghee Koh (Chair by Dr. Samir Khatir)
09:30 – 09:45	**Coffee Break**	

Section 1: Advances in Engineering and Materials

Chair by Prof. Nicholas Fantuzzi

Time	Activity (Grand Function Hall – First floor)	Speakers
09:45 – 09:55	**Invited Speech 1**: Hempcrete – a carbon negative material: from its performance to application in buildings	Pham Tien Cuong
09:55 – 10:05	**Invited Speech 2**: Impact of Opening Ratio on the Structural Performance of Reinforced Concrete Frames with Infill Walls	Phu Anh Huy Pham
10:05 – 10:15	**Invited Speech 3**: Effects Of Circular Web Holes on Shear Strengths of Cold-formed Steel Channel Sections	Ngoc Hieu Pham
10:15 – 10:25	**Invited Speech 4**: Numerical simulation of combustion kinetics for thermal degradation in Laminated Veneer Lumber (LVL) under fire exposure	Vu Thi Bich Quyen
10:25 – 10:35	**Invited Speech 5:** Impact of Dimensions of Flanges and Lips on Shear Strengths of Thin-Walled Steel Channel Sections	Ngoc Hieu Pham
10:35 – 10:45	**Invited Speech 6**: Modelling of timber-to-timber composite beam using welded-through wood dowels	Nguyen Hong Son
10:45 – 10:55	**Invited Speech 7**: Ground Granulated Blast Furnace Slag and Fly Ash in Cement with Ultra-Low Clinker Content	Mai Thanh Pham
10:55 – 11:05	**Invited Speech 8**: Effects of Rubber Aggregate and Fiber Carbon on Pervious Concretes	Nguyen Thi Bich Thuy

11:05 – 11:15	**Invited Speech 9**: Strengthening Old Post-Tensioned Concrete Beams Using External FRP Sheets	Pham Dinh Trung Nghia
11:15 – 11:25	**Invited Speech 10**: Investigation of Local Buckling Loads of Cold formed Steel Channel Sections with Eccentric Web Holes Under Compression	Ngoc Hieu Pham
11:30 – 12:30	**Lunch party**	

Section 2: Structural Health Monitoring

Chair by Prof. Chan Ghee Koh

Time	Activity (Paramount – First floor)	Speakers
09:45 – 09:55	**Invited Speech 11**: Enhancing vibration-based failure identification in beam structures using statistical features and machine learning	Long Viet Ho
09:55 – 10:05	**Invited Speech 12**: Pipe Safety Monitoring via Flexible Strain Sensors	Seung-Kyun Kang
10:05 – 10:15	**Invited Speech 13**: Forecasting the Ultimate Load Capacity of Flat Slabs with Artificial Neural Networks	Hieu Phuong Vu
10:15 – 10:25	**Invited Speech 14**: Modal strain energy and convolutional neural network-based damage identification in plate-like structures	Bui Ngoc Tuan Hung
10:25 – 10:35	**Invited Speech 15**: Detecting multiple damages in I-section steel beams using an improved mode shape curvature change-based method	Khanh Hoang Vu
10:35 – 10:45	**Invited Speech 16**: Factors Affecting the Structural Health of French Colonial Architecture in Vietnam	Le Duy Thanh
10:45 – 10:55	**Invited Speech 17**: Compressed Sparse Regression for Anchored Design of Experiments and Sensor Placement in Structure Health Monitoring.	Yunpeng Zhu
10:55 – 11:05	**Invited Speech 18**: Optimized convolutional neural networks using orthogonal array for concrete crack detection	Tran Duc Manh
11:05 – 11:15	**Invited Speech 19**: Predicting Building Energy Consumption Considering Climate Change using 6D BIM and Machine Learning	Nguyen Tran Hieu
11:30 – 12:30	**Lunch party**	

Section 3: Optimization and Machine learning in Engineering Problems

Chair by Assoc. Prof. Nguyen Thoi Trung

Time	Activity (Summit – First floor)	Speakers
09:45 – 10:05	**Important Speech 1**: An adaptive DNN-assisted metamodel for damage detection of steel frames based on incomplete frequencies and mode shapes with limited training datasets	Nguyen-Thoi Trung
10:05 – 10:15	**Invited Speech 20**: Optimized Supervised Machine Learning for Accurate Estimation of Reinforcement in RC Beams and Columns	Thai Duong Le
10:15 – 10:25	**Invited Speech 21**: Optimization of sensor locations for homogeneous beams in structural health monitoring using isogeometric analysis and differential evolution	Lieu Minh Quan
10:25 – 10:35	**Invited Speech 22**: Truss Structure Optimization Using the Portia Spider Algorithm: A Bio-Inspired Approach	Thuy Dung Dau
10:35 – 10:45	**Invited Speech 23**: A Multiverse Optimizer for Time-Cost Trade-Off of Vehicle Routing Problem	Van Nam Nguyen
10:45 – 10:55	**Invited Speech 24**: Multi-damage identification in three-dimensional frame structures via a combined MSE-based method and PSO algorithm	Van Sy Bach
10:55 – 11:05	**Invited Speech 25**: An advanced metaheuristic framework for time–cost–quality optimization in complex construction projects	Khanh - Nhan Tran
11:05 – 11:15	**Invited Speech 26**: Damage detection of trusses utilizing free vibration signals and Convolutional neural network relied on model order reduction	Tan T. Nguyen
11:30 – 12:30	**Lunch party**	

11:30 - 12:30

LUNCH PARTY

at

Abalone Hall- First Floor

DAY 1 – THURSDAY AFTERNOON, AUGUST 07, 2025

Section 4: Advances in Construction Management

Chair by Assoc. Prof. Thanwadee Chinda

Time	Activity (Grand Function Hall – First floor)	Speakers
13:35 – 13:55	**Important Speech 02**: Strategies to Achieve Sustainable Concrete Waste Recycling	Thanwadee Chinda
13:55 – 14:05	**Invited Speech 27**: Geotechnical Risk Management in Pipe-Jacking Construction Using Fuzzy-FMEA: A Case Study of the Yen Xa Sewerage System Project	Giang Vu-Thi-Thuy
14:05 – 14:15	**Invited Speech 28**: Completion of the final settlement of public investment capital in construction in Vietnam	Dung Nguyen Thi Tuyet
14:15 – 14:25	**Invited Speech 29**: Designing Pedestrian Streets in Hanoi to Reduce Greenhouse Gas Emissions	Luong Tu Quyen
14:25 – 14:35	**Invited Speech 30**: Quantitative Assessment of Damage in Cementitious Beams via Acoustic Emission Technique (AET)	Tam Nguyen-Tat
14:35 – 14:45	**Invited Speech 31**: Toward Context-Aware AI Agent Integration in BIM for Ondol System Design and Maintenance Communication	Tran Van Tien Si
14:45 – 14:55	**Invited Speech 32**: Improving the Management of Road Infrastructure Maintenance in Vietnam for the Period 2025 - 2030	Nguyen Thi Tuyet Dung
14:55 – 15:05	**Invited Speech 33**: Pedestrian streets contribute to develop the low emission zone in Hanoi's inner area	Pham Thi Ngoc Lien
15:05 – 15:15	**Invited Speech 34**: An Integrated Municipal Solid Waste Management Scheme for Carbon Footprint Reduction: Leveraging the Informal Sector in Hanoi	Take Kyoko **(Online)**
15:15 – 15:30	**Coffee Break**	

Section 5: Advances in Architectural Design

Chair by Assoc. Prof. Khuat Tan Hung

Time	Activity (Summit – First floor)	Speakers
13:35 – 13:55	**Important Speech 03**: The Origins of the Wooden Structural Framework in the Traditional Architecture of Central Vietnam	Khuat Tan Hung
13:55 – 14:05	**Invited Speech 35**: Solutions for developing the Tam Giang Lagoon- Hue in the context of climate change	Chau Huynh Bao
14:05 – 14:15	**Invited Speech 36**: Landscape Architecture of Industrial Zones in Hanoi, Vietnam	Le Thi Ai Tho
14:15 – 14:25	**Invited Speech 37**: A proposed spatial structure model for interactive museum exhibitions	Tran Ngoc Thanh Trang
14:25 – 14:35	**Invited Speech 38**: Application of the NSGA-II Algorithm for Optimizing Construction Site Layout Planning	Nguyen Xuan Thanh
14:35 – 14:45	**Invited Speech 39**: Promoting some traditional Vietnamese architectural and cultural values in the design of new coastal urban areas adapting to climate change	Nguyen Dinh Phong
14:45 – 14:55	**Invited Speech 40**: Landscape architecture as a formative element in shaping Dalat's urban identity	Nguyen Thi Nhu Trang
14:55 – 15:05	**Invited Speech 41**: A Hybrid Model Combining Regression Analysis and Taguchi to Enhance the Utilization of Expert Knowledge in Tree Planning for Architectural Design	Tran Le Anh
15:05 – 15:15	**Invited Speech 42**: Energy Consumption Comparison using 6D BIM Tool: A Case Study of a 2-Storey House in Hanoi, Vietnam	Nguyen Tran Hieu
15:15 – 15:30	**Coffee Break**	

Section 6: Computational mechanics

Chair by Assoc. Prof. Liang Cheng

Time	Activity (Paramount – First floor)	Speakers
13:35 – 13:55	**Important Speech 04**: An Analytical Approach for Free Vibration Analysis of Beams Considering Lateral Shear Strain Using Independent Displacement and Shear Force Variables	Thanh Thuy Vu

13:55 – 14:05	**Invited Speech 43**: Experimental Study on The Combustion Properties of Glued Laminated Timber Structures	Do Tien Thinh
14:05 – 14:15	**Invited Speech 44**: A new analytical proposal for evaluating torsional behavior of FRP-strengthened reinforced concrete beam based on modified-softened-variable-angle-truss model	Vinh Sang Nguyen
14:15 – 14:25	**Invited Speech 45**: The effectiveness of the DMM method in ground improvement for stability during soil treatment	Phu-Huan Vo Nguyen
14:25 – 14:35	**Invited Speech 46**: Numerical investigation of kinetic pyrolysis in fire-exposed compressed Spruce panels	Tran Trong Tuan
14:35 – 14:45	**Invited Speech 47**: Analytical and FEM Load-Deflection Behavior of Reinforced Concrete Beams Strengthened with a Combination of Fiber-Reinforced Cementitious Matrix and Fiber-Reinforced Polymer	Pham Nguyen The Thanh
14:45 – 14:55	**Invited Speech 48**: Micromechanical Analysis of Variable Angle Tow Composites Considering Uncertainties in Constituents	Trang Le
14:55 – 15:05	**Invited Speech 49**: Navier solution for static behavior analysis of smart FGP beams resting on Pasternak foundation and subjected to electro-mechanical load	Do Minh Duc
15:05 – 15:15	**Invited Speech 50**: The effectiveness of applying high-strength geotextile on top of timber piles for foundation reinforcement	Phu-Huan Vo Nguyen
15:15 – 15:30	**Coffee Break**	

Section 7: Advances in Structural Engineering

Chair by Assoc. Prof. Tran Thi Thuy Van

Time	Activity (Summit – First floor)	Speakers
15:30 – 15:50	**Important Speech 05**: Modeling Truss Structures with Initial Length Imperfections Using Hybrid Finite Element Approach	Tran Thi Thuy Van
15:50 – 16:00	**Invited Speech 51**: Enhancement of Mechanical Performance of Cement Pastes Prepared with Concrete Reclaimed Water Using CO2 Intermixing	Tuan Minh Ha
16:00 – 16:10	**Invited Speech 52**: A Hybrid Whale Optimization Algorithm Approach for Efficient Bottled Water Distribution	Nguyen Van Nam

16:10 – 16:20	**Invited Speech 53**: An investigation on the Multi-storey building's the modal vibration using Low-Cost Sensor based on Frequency Domain Decomposition	Vinh Nguyen Quang
16:20 – 16:30	**Invited Speech 54**: Determination of Wind Load on High-Rise Buildings by Wind Tunnel Test in Vietnam	Vu Thanh Trung
16:30 – 16:40	**Invited Speech 55**: Silica Effects on Properties of Portland Cement Used in Oil Well Construction	Mai Thanh Pham
16:40 – 16:50	**Invited Speech 56**: An enhanced algorithm for segmenting point clouds into clusters based on Euclidean distance	Tran Thanh Ha
16:50 – 17:00	**Invited Speech 57**: Detectability Analysis of Structural Defects Using Lamb Waves: A Frequency-Based Approach for Structural Health Monitoring	Juan Pablo Brazalez Reinoso (**Online**)
18:00 – 20:30	**GALA DINNER**	

Section 8: Engineering management

Chair by Dr. Phong Thanh Nguyen

Time	Activity (Paramount – First floor)	Speakers
15:30 – 15:50	**Important Speech 06**: Sustainable Construction Contractors Selection using EDAS	Phong Thanh Nguyen
15:50 – 16:00	**Invited Speech 58**: Current Situation, Challenges, and Some Proposals for Developing the BOT Contract Investment Model in Road Transportation in Vietnam	Le Viet Hoa
16:00 – 16:10	**Invited Speech 59**: Evaluating Critical Success Factors for Construction Projects: A Case Study in Vietnam	Hoang Le Yen Nhi
16:10 – 16:20	**Invited Speech 60**: Investigating Sustainable Criteria for Site Selection of Construction WasteWater Treatment Plant: A Case Study in Ho Chi Minh City	Tran Thanh Ha
16:20 – 16:30	**Invited Speech 61**: Efficient Resource Leveling in Multi-Project Scheduling Environment with an Integrated Mountain Gazelle Optimizer and Opposition-Based Learning	Thuy Dung Dau
16:30 – 16:40	**Invited Speech 62**: Modeling Relationships between BSC-Oriented Attributes and Challenge Factors to Contractors' Sustainability Productivity Management	Nguyen Le Minh Long

16:40 – 16:50	**Invited Speech 63**: What are the risky behaviors of residents when driving? And do stress, mental fatique, and anxiety affect them?	Chanh Toan Pham
16:50 – 17:00	**Invited Speech 64**: The Influence of Health Conditions and Psychoactive Subtances on the Intention to Use Metro	Cong Hau Truong
18:00 – 20:30	**GALA DINNER**	

Section 9: Structural mechanics

Chair by Dr. Nhon Nguyen-Thanh

Time	Activity (Grand Function Hall – First floor)	Speakers
15:30 – 15:50	**Important Speech 07**: A hybrid phase-field model for anisotropic brittle and ductile fracture in advanced materials	Nhon Nguyen-Thanh
15:50 – 16:00	**Invited Speech 65**: Theoretical solution of the Timoshenko beam layed on the foundation subjected to dynamic load	Le Hung Tran
16:00 – 16:10	**Invited Speech 66**: Buckling Reliability of Composite Cylindrical Shells for Hydrogen Storage: Influence of Stacking Sequence and Material Property Variability	Luan Trinh
16:10 – 16:20	**Invited Speech 67**: Identifying Nonlinear Output Frequency Response Functions using Generalized Associated Linear Equations with Recursive and Coupled Computational Methods	Wenbo Zhang
16:20 – 16:30	**Invited Speech 68**: Investigate the influenced parameters for exterior RC joint behavior by ABAQUS	Nguyen Viet Phuong
16:30 – 16:40	**Invited Speech 69**: Numerical Modelling of Densified Wooden Nails in Timber Assemblies Using Abaqus	Nguyen Le Thuy
16:40 – 16:50	**Invited Speech 70**: Influence of specimen shape and compaction energy on the compressive strength of slag-RCC prepared using the modified Proctor test	Le Chau Tuan
16:50 – 17:00	**Invited Speech 71**: Study on the Mechanical Properties of Glued Laminated Timber Members and Performance of Beam-Column Connections	Do Tien Thinh
18:00 – 20:30	**GALA DINNER**	

18:00 - 20:30

GALA DINNER

at

Abalone Hall- First Floor

DAY 2 – FRIDAY MORNING, AUGUST 08, 2025

Section 10: Prediction method in engineering structures

Chair by Prof. Imene Ait Sidhoum

Time	Activity (Grand Function Hall – First floor)	Speakers
08:00–08:30	**Plenary lecture 3**: Artificial Intelligence Innovations in Structural Health Monitoring	Samir Khatir
08:30–08:40	**Invited Speech 72**: Monitoring Column and Shear Wall Shortening in High-Rise Buildings	Giang Van Khiem **(Online)**
08:40– 08:50	**Invited Speech 73**: Damage Classification of Steel Frames Using Long Short-Term Memory and Fully Convolutional Network Models	Truong Thanh Chung
08:50– 09:00	**Invited Speech 74**: Application of Artificial Intelligence for Detecting Worker Safety Harness Usage During Work at Height to Enhance Safety Risk Management	Tran Le Anh
09:00– 09:15	**Coffee Break**	

Section 10-1: Prediction method in engineering structures

Chair by Assoc. Prof. Vu Thi Bich Quyen

Time	Activity (Grand Function Hall – First floor)	Speakers
09:15– 09:30	**Important Speech 08**: RTK and PPK method in automatic monitoring	Vu Ngoc Quang
09:30– 09:40	**Invited Speech 75**: Assessing the attributes influencing construction project performance from the perspective of different stakeholders	Van Luy Tong
09:40– 09:50	**Invited Speech 76**: Microgrid Energy Management with the Sand Cat Swarm Optimization	Van Nam Nguyen
09:50– 10:00	**Invited Speech 77**: Hybrid Machine Learning for Accurate Prediction of CFST Column Compressive Strength	Tran Trung Nguyen
10:00– 10:10	**Invited Speech 78**: Numerical analysis of plant-root-reinforced slope in Go Cong, Tien Giang, Vietnam	Nguyen Quoc Hung
10:10– 10:20	**Invited Speech 79**: Do Social Constructs and Big-5 Personality Traits Affect the Metro Use? An Application of CART in Decision Tree Model	Nghia Pham
10:20– 10:30	**Invited Speech 80**: An Assessment of Critical Success Factors for Mitigating	Minh Nhut Tran

	Cost Overruns in Public Infrastructure Construction	
10:30 – 10:40	**Invited Speech 81**: Prediction of Concrete Compressive Strength Using Boosting-Based Machine Learning Algorithms	Truong-Giang Nguyen **(Online)**
10:40– 10:50	**Invited Speech 82**: Boosting-based machine learning algorithms for predicting liquefied soil settlement	Van Than Tran (**Online**)

Section 5-1: Advances in Architectural Design

Chair by Assoc. Prof. Khuat Tan Hung

Time	Activity (Paramount – First floor)	Speakers
08:15–08:30	**Important Speech 09**: The Influence of Foreign Design In Contemporary Vietnamese Architecture	Dang Hoang Vu
08:30– 08:40	**Invited Speech 83**: Typologies of agro-industrial parks suitable for Vietnam	Tran Quang Huy
08:40– 08:50	**Invited Speech 84**: Smart Parks-Challenges and Development opportunities in Vietnam	Huong Thi Dieu Nguyen **(Online)**
09:00– 09:15	**Coffee Break**	

Section 11: Underground engineering

Chair by Dr. Pham Huu Ha Giang

Time	Activity (Paramount – First floor)	Speakers
09:15– 09:30	**Important Speech 10**: Study the Behavior of Flexible Pipes Considering the Dilatancy Effect of Sand	Giang Vu-Thi-Thuy
09:30– 09:40	**Invited Speech 85**: Settlement Prediction of Nodular Piles: A Machine Learning Perspective	Nguyen Tan
09:40– 09:50	**Invited Speech 86**: Properties of CDM Columns from Unconfined Compression Test: A case study in Ho Chi Minh City	Nguyen Khac Tan Da
10:00– 10:10	**Invited Speech 87**: A Comprehensive Review of Load Distribution in Piled Raft Foundations: Effects of Pile Number and Spacing on Pile Raft Interaction	Vo Van Dau
10:10– 10:20	**Invited Speech 88**: Investigating natural frequencies of sand Soil Foundations for predicting landslide Based on Field Tests	Quynh Le Bao
10:20– 10:30	**Invited Speech 89**: Displacement analysis of CDM retaining walls with CDM bottom-enhanced stability in soft ground excavation in Ho Chi Minh City	Thanh Nhan Pham

10:30– 10:40	**Invited Speech 90**: TPE-Optimized Neural Network Framework for Predicting Settlement of Nodular Pile Foundations	Nguyen Tan
10:40– 10:50	**Invited Speech 91**: An undrained cyclic behavior of reinforced liquified stabilized soil cured outdoor	Hung Khac Le

Section 4-1: Advances in Construction Management

Chair by Assoc. Prof. Thanwadee Chinda

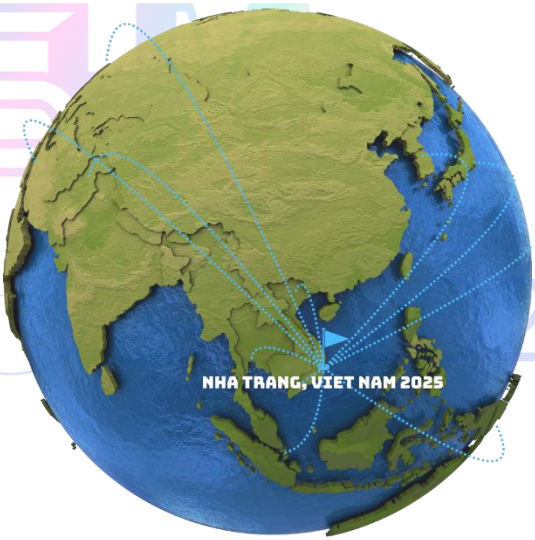
Time	Activity (Summit – First floor)	Speakers
08:15–08:30	**Important Speech 11**: Factors affecting construction cost contingencies: An integrated analysis of key factors in construction projects	Vo Dang Khoa
08:30– 08:40	**Invited Speech 92**: Critical factors affecting the project management processes of construction projects in Vietnam from different viewpoints of stakeholders	Dung Thuy Dinh
08:40– 08:50	**Invited Speech 93**: Social-Demographic and Transportation Habit Effects on Residents' Intention to Use Metro	Nghia Pham
08:50– 09:00	**Invited Speech 94**: Analyzing Motivators for Facilitating Circular Economy Implementation in Vietnamese Construction Enterprises	Minh Huy Nguyen
09:00– 09:15	**Coffee Break**	

Section 12: Dynamic and Stability Analysis of Structures

Chair by Assoc. Prof. Nguyen Trong Phuoc

Time	Activity (Paramount – First floor)	Speakers
09:15– 09:30	**Important Speech 12**: Load-Bearing Capacity of Reinforced Concrete Beams with Corroded Longitudinal Rebars	Duy Nguyen Phan
09:30– 09:40	**Invited Speech 95**: Influence of earthquake frequency content on soil liquefaction	Nguyen Van Quang
09:40– 09:50	**Invited Speech 96**: Navier-based approach for static and vibration analysis of FGP-core sandwich plates with FG-CNTRC cross-ply laminated face sheets	Hoang Nam Nguyen
10:00– 10:10	**Invited Speech 97**: Steel slag as a sustainable substitute in concrete	Nguyen Van Nam
10:10– 10:20	**Invited Speech 98**: Limit State of Elastic Strip under Combined Loading	Pham Ngoc Vuong

10:20– 10:30	**Invited Speech 99**: The Impact of Periodic Tidal Variations on the Stability of Riverbanks	Nhut-Nhut Nguyen **(Online)**
10:30– 10:40	**Invited Speech 100**: Reliable and Interpretable AI for CFST Column Safety Assessment	Tran Trung Nguyen
10:40– 10:50	**Invited Speech 101**: Static Analysis of Carbon Nanotube Reinforced Solid Plate by Using Iso-geometric Analysis	Ngo Khanh Binh



ABSTRACT DETAILS

Section 1: Advances in Engineering and Materials

Invited Speech 1

Hempcrete - a carbon negative material: from its performance to application in buildings

Speaker **Pham Tien Cuong**

Section *1 (Time: 09:45 – 09:55, August 07, 2025)*

Abstract

We are living in an era where environmental challenges are becoming increasingly urgent, as the pursuit of economic growth continues to accelerate. The construction industry, in particular, significantly contributes to greenhouse gas emissions due to the processes involved in the production, construction, and lifecycle use of building materials. Addressing this issue requires innovative approaches and materials that balance economic and environmental priorities. Hempcrete, a composite material made from hemp shives (the woody core of the hemp plant) and lime, has emerged as a promising solution. It is recognized as a "carbon-negative" material because it absorbs more CO2 during its lifecycle than it emits. Moreover, hempcrete is derived from natural, renewable resources, making it inherently eco-friendly. This material is not only sustainable but also offers exceptional properties, such as being lightweight, highly soundproof, and providing superior thermal insulation. The application of hempcrete in construction projects represents a forward-thinking approach to green building. This paper delves into the performance characteristics of hempcrete and highlights its multifaceted benefits. Beyond its contributions to environmental protection and energy efficiency, hempcrete can reduce the loads on buildings by replacing traditional masonry materials like burned clay and unburned bricks, it saves the materials like concrete and steel, further promoting sustainability in the construction industry.

Invited Speech 2

Impact of Opening Ratio on the Structural Performance of Reinforced Concrete Frames with Infill Walls

Speaker **Phu Anh Huy Pham**

Section *1 (Time: 09:55 – 10:05, August 07, 2025)*

Abstract

This study investigates the influence of the wall opening ratio on the structural behavior of reinforced concrete (RC) frames with infill walls (IWs), focusing on the responses of columns, beams, and the first natural period . A finite

element model incorporating stiffness degradation and gap elements was developed and validated against experimental results. Numerical analyses were conducted for four wall thicknesses (70, 110, 220, and 330mm) and opening ratios ranging from 0% to 100%. Results indicate that in columns, lateral displacement () increases significantly with the opening ratio, while bending moment () also increases and shear force () decreases—demonstrating internal force redistribution from the IWs to the RC frame. In beams, deflection () increases markedly, especially beyond 60% opening ratio, while both and decrease sharply, reflecting reduced wall–beam interaction. Thicker walls lead to smaller deformations and more uniform structural responses. The study also shows that increases as the opening ratio rises and decreases as wall thickness increases, indicating a reduction in lateral stiffness caused by the infill walls. Based on the results, a 40% opening ratio is recommended as a practical limit to maintain overall structural stability, while reinforcement measures are advised for ratios exceeding 60%. The findings provide a quantitative basis for optimizing the seismic design of RC frames with IWs under lateral loading conditions.

Invited Speech 3

Effects Of Circular Web Holes on Shear Strengths Of Cold-formed Steel Channel Sections

Speaker **Ngoc Hieu Pham**

Section *1 (Time: 10:05 – 10:15, August 07, 2025)*

Abstract Holes are typically drilled into cold-formed steel sections to meet the requirements for installing technical systems in buildings. These drilled holes can impact the load-bearing capacity of the sections, a factor that has been studied and incorporated into design standards. In addition to evaluating compression and bending capacities, it's crucial to also address the effect of these drilled holes on shear strength in design considerations. This paper, therefore, aims to explore how drilling, specifically circular holes, affects the shear strength of a common structural section namely the channel section. The study focuses on widely used sections in the market, with materials and design methods following Australian standards. The findings will help evaluate how the size of circular holes influences the shear strength of channel sections. Additionally, the paper provides recommendations for selecting hole sizes to assist designers in considering the shear strength of perforated sections.

Invited Speech 4

Numerical simulation of combustion kinetics for thermal degradation in Laminated Veneer Lumber (LVL) under

Speaker **Vu Thi Bich Quyen**

Section *1 (Time: 10:15 – 10:25, August 07, 2025)*

Abstract This research presents a detailed numerical simulation of combustion kinetics and thermal decomposition characteristics of Laminated Veneer Lumber (LVL) when subjected to fire conditions. A comprehensive finite element modeling framework is implemented to simulate heat transfer and predict the progression of material degradation in LVL structures exposed to elevated temperatures. The study incorporates advanced kinetic reaction models to accurately depict the complex thermal decomposition processes, providing insight into structural behavior and fire performance of engineered wood materials.

Invited Speech 6

Impact of Dimensions of Flanges and Lips on Shear Strengths of Thin-Walled Steel Channel Sections

Speaker **Ngoc Hieu Pham**

Section *1 (Time: 10:25 – 10:35, August 07, 2025)*

Abstract Thin-walled steel sections are widely utilized in construction due to their advantageous properties. From a structural perspective, these sections are designed to withstand various forces, including compression, bending, and shear, among others. While the behaviors under compression and bending are well-established within theoretical calculations, the analysis of shear resistance involves a range of different considerations and theories. Historically, shear capacities were traditionally assumed to be considered solely by webs of steel sections although the presence of the lips and flanges also significantly influences the shear strengths of these sectional types. With advancements in linear buckling analysis, the influence of these components on shear strengths of such sections is now being considered. Therefore, this paper will explore the impact of the dimensions of components such as lips and flanges on the shear capacity of cold-formed steel sections with channel shapes. The goal is to provide recommendations for optimizing the shear resistance of these sections.

Invited Speech 7

Modelling of timber-to-timber composite beam using welded-through wood dowels

Speaker **Nguyen Hong Son**

Section *1 (Time: 10:35 – 10:45, August 07, 2025)*

Abstract This study investigates the structural behavior of timber-to-timber composite beams connected using welded-through wood dowels, a novel fastening technique that enhances compatibility and sustainability compared to traditional metal connectors. Full-scale two-layer timber beams were fabricated and subjected to four-point bending tests to assess flexural performance, stiffness, and load distribution. Each specimen consisted of solid wood boards joined with 56 welded dowels, evenly spaced along the beam span. A corresponding finite element model was developed using Abaqus, exploiting geometric symmetry to improve computational efficiency. Two models were compared: a dowel-connected beam and an unjointed reference beam. Orthotropic material properties were assigned to simulate the anisotropic behavior of spruce timber, with fictitious vertical dowels adjusted for oblique orientation through local material rotation. The model incorporated detailed contact interactions and boundary conditions to replicate the physical test setup accurately. Results demonstrate that welded-through dowels significantly enhance shear transfer between timber layers, increasing global stiffness and improving structural integrity. Load-deflection curves from both experimental and numerical models confirm the effectiveness of the dowel system in achieving partial to near-full composite action. These findings suggest that welded-through dowels are a viable solution for sustainable, high-performance timber composites in structural applications.

Invited Speech 8

Ground Granulated Blast Furnace Slag and Fly Ash in Cement with Ultra-Low Clinker Content

Speaker **Mai Thanh Pham**

Section *1 (Time: 10:45 – 10:55, August 07, 2025)*

Abstract This paper presents research conducted into cement production with an extremely low clinker content. Hoang Thach Portland clinker was used at a dosage of less than 10% by mass. Fly ash and ground granulated blast furnace slag (GGBFS) were utilized in varying proportion, with slag content ranging from 60 to 90% and fly ash content from 10 to 30%. The results show that all samples exhibited acceptable consistency and setting times. More importantly, the cement containing 90% GGBFS, 9,6%

clinker and 0,4% gypsum demonstrated good compressive strength. Its compressive strength, at 28 days of age, exceeded 30 MPa, equivalent to 60% of that of conventional cement containing 96% clinker. Another mix comprising 80% GGBFS and 10% fly ash achieved a compressive strength of nearly 28 MPa, which represented 54% of the control sample's strength. In conclusion, it is feasible to produce cement with ultra-low clinker content using ground granulated blast furnace slag and fly ash.

Invited Speech 9

Effects of Rubber Aggregate and Fiber Carbon on Pervious Concretes

Speaker **Nguyen Thi Bich Thuy**

Section *1 (Time: 10:55 – 11:05, August 07, 2025)*

Abstract The purpose of this paper is to investigate the effects of rubber aggregate and carbon fiber on basic properties of pervious concrete including compressive strength, porosity, and water permeability coefficient. The rubber aggregate is artificial aggregate made from the combining cement, fly ash, crushed rubber, and water with a ratio of 1:1:0.05:0.25. After 7 days of curing, the rubber aggregate is used to replace limestone by 0%, 10%, and 20% by volume, the carbon fiber to cement is 0.3%. The tested results show that the compressive strength of pervious concrete is enhanced 27.03% by using 10% of rubber aggregate, especially containing carbon fiber when compared to the controlled concrete. When the rubber aggregate content increases, the compressive strength tends to reduce. The porosity and compressive strength have a well correlation. The use of rubber aggregate leads to a lower water permeability coefficient. The mixture containing 10% rubber aggregate and carbon fiber shows the best properties with the highest compressive strength, the lowest porosity and water permeability coefficient. Therefore, the use rubber aggregate in the pervious concrete is suitable for road surface, sidewalk, or parking lot to avoid flooding in the rain season.

Invited Speech 10

Strengthening Old Post-Tensioned Concrete Beams Using External FRP Sheets

Speaker **Pham Dinh Trung Nghia**

Section *1 (Time: 11:05 – 11:15, August 07, 2025)*

Abstract The efficacy of externally bonded fibre-reinforced polymer (FRP) systems for reinforcing old unbonded post-

tensioned concrete (UPC) beams remains unexplored. This experimental research aims to address this gap. The experiment involved four UPC beams, i.e., one new beam and three old beams (aged more than 6.5 years). External FRP sheets proved effective in restoring the deteriorated functionality of the old UPC beams and improving their performance. By resisting tensile stresses and increasing flexural stiffness, FRP reinforcement significantly improved the old beams' behaviour in terms of deflection and load-carrying capacity. The FRP-strengthened old beams outperformed the new beam, especially in the ultimate stage.

Invited Speech 11

Investigation of Local Buckling Loads of Cold-formed Steel Channel Sections with Eccentric Web Holes Under Compression

Speaker **Ngoc Hieu Pham**

Section *1 (Time: 11:15 – 11:25, August 07, 2025)*

Abstract Thin-walled steel sections with perforations are widely used for technical installation requirements, but their structural capacities are reduced due to the presence of perforations. These reductions are addressed in the American Specification through the Direct Strength Method (DSM), a modern approach for designing cold-formed steel sections. The DSM allows for the prediction of strengths of perforated sections by utilising elastic buckling loads, with this analysis being a necessary component for its application. Currently, design guidelines apply to thin-walled sections with concentric web holes, and elastic buckling analyses are typically based on this configuration. Web holes, however, are often drilled eccentrically due to technical constraints; and this can alter the strengths and behaviors of such steel members. This paper therefore investigates the impact of eccentric web holes on local buckling loads of thin-walled sections due to compression. The THIN-WALL-2 software package will be used for the elastic buckling analysis. The investigated results will demonstrate the reduction in local buckling loads for sections with eccentric holes compared to concentric ones. This will be the foundation for further research to provide design recommendations.

Section 2: Structural Health Monitoring

Invited Speech 12	**Enhancing vibration-based failure identification in beam structures using statistical features and machine learning**
Speaker	**Long Viet Ho**
Section	*2 (Time: 09:45 – 09:55, August 07, 2025)*
Abstract	Early diagnosis of structural damage, particularly in identifying its location, is essential for timely repair and maintenance. A vibration-based approach is effective, as damage alters a structure's dynamic properties. Among these, mode shape-based methods offer faster, simpler localization than frequency-based ones. This study proposes a statistically based approach to enhance damage localization by applying a threshold to suppress false peaks in undamaged areas. Numerical studies on two beam-like structures confirm its superior accuracy compared to the modal curvature and mode shape curvature square methods. The method's robustness is validated under varying conditions, such as different mode numbers, sensor sparsity, and damage levels. To quantify damage extent, an artificial neural network (ANN) model optimized using a stochastic algorithm is employed. The optimized ANN achieves less than 2% error, even with added white Gaussian noise. The findings confirm the efficiency and reliability of the proposed approach in both localizing and quantifying structural damage.

Invited Speech 13	**Pipe Safety Monitoring via Flexible Strain Sensors**
Speaker	**Seung-Kyun Kang**
Section	*2 (Time: 09:55 – 10:05, August 07, 2025)*
Abstract	Ensuring the structural integrity of polymer pipes and hydrogen storage vessels is challenging due to the risk of sudden or delayed failure, which limits the effectiveness of conventional periodic inspections. Recent advances in flexible electronics have enabled real-time detection of subtle mechanical deformations using skin-attachable sensors. In this work, we introduce a flexible strain sensor system adapted for curved pipe surfaces, enabling continuous and non-invasive safety monitoring. The proposed system employs crack-based sensors inspired by spider legs, capable of detecting microstrain induced by internal crack propagation. These sensors, fabricated by inducing controlled microcracks in metal thin films, exhibit sharp resistance changes in response to minute mechanical deformation. We demonstrate that the system

can detect early-stage failure by correlating surface strain with subsurface crack development through finite element analysis and benchtop experiments. This technology offers a promising alternative for safety assessment in scenarios where conventional inspection is impractical, and provides a potential pathway toward autonomous structural health monitoring in polymer-based infrastructure.

Invited Speech 14

Forecasting the Ultimate Load Capacity of Flat Slabs with Artificial Neural Networks

Speaker **Hieu Phuong Vu**

Section *2 (Time: 10:05 – 10:15, August 07, 2025)*

Abstract

Flat slabs are increasingly popular in modern construction due to their beamless design and ability to optimize space. They help reduce story height and maximize usable floor area. However, accurately predicting the ultimate load capacity of flat slabs is still challenging, influenced by factors such as geometry, materials, and load conditions. This study applies an Artificial Neural Network (ANN) model to predict the ultimate punching shear load of fiber-reinforced concrete slabs, based on 232 experimental data samples. The model consists of four hidden layers and is trained using advanced techniques to enhance generalization capability. Results show that the model achieves high prediction accuracy, with a coefficient of determination $R^2 = 0.936$ and a mean absolute percentage error (MAPE) of 11.88%. These findings demonstrate that ANN is an effective tool for predicting the punching shear capacity of flat slabs.

Invited Speech 15

Modal strain energy and convolutional neural network-based damage identification in plate-like structures

Speaker **Bui Ngoc Tuan Hung**

Section *2 (Time: 10:15 – 10:25, August 07, 2025)*

Abstract

The modal strain energy (MSE)-based technique is a highly effective approach for damage identification. In this study, it is chosen among vibration-based techniques to present a method for identifying damage in plate-like structures via a convolutional neural network. The finite element method (FEM) is utilized to analyze the free vibration of the plate to obtain the natural frequencies and mode shapes of six initial bending modes. These data serve as the primary input for the presented method. To validate the feasibility of the presented method, this study

investigates a simply supported aluminum plate. The results reveal that the presented method successfully identifies the damage in the plate by utilizing the appropriate modal strain energy data and establishing a damage threshold.

Invited Speech 16

Detecting multiple damages in I-section steel beams using an improved mode shape curvature change-based method

Speaker **Khanh Hoang Vu**

Section *2 (Time: 10:25 – 10:35, August 07, 2025)*

Abstract

In this study, an improved mode shape curvature change-based technique is introduced for detecting the appearance and location of damage in I-section steel beams. The vibration of a steel beam is numerical analyzed in both undamaged and damaged cases using the finite element (FE) method, where damage is introduced by reducing the flexural rigidity of the corresponding beam elements. Next, the damage location is determined based on a defined damage threshold. This research is conducted in two steps of structural health monitoring (SHM): (i) evaluating the occurrence of damage using a vibration characteristics-based method; and (ii) proposing an appropriate damage threshold for detection and assessing its effectiveness through damage zone accuracy indices. The findings indicate that the mode shape curvature change-based method has high precision in the damage detection in both the damage's appearance and location.

Invited Speech 17

Factors Affecting the Structural Health of French Colonial Architecture in Vietnam

Speaker **Le Duy Thanh**

Section 2 (Time: 10:35 – 10:45, August 07, 2025)

Abstract

The French colonial period in Vietnam left behind a significant architectural heritage, particularly in major cities such as Hanoi and Ho Chi Minh City. These structures are not only aesthetically valuable but also hold deep historical significance, contributing to the formation of the current urban identity. However, the number of French colonial architecture (FCA) has been declining significantly. One of the main reasons for this deterioration is the lack of structural health monitoring methods in management, leading to degradation, damage, and even safety risks.

This study focuses on French colonial architecture in Hanoi, analyzing factors affecting structural health and proposing appropriate monitoring methods to preserve and maintain the value of this architectural heritage

Invited Speech 18

Compressed Sparse Regression for Anchored Design of Experiments and Sensor Placement in Structure Health Monitoring

Speaker **Yunpeng Zhu**

Section *2 (Time: 10:45 – 10:55, August 07, 2025)*

Abstract

This study investigates sensor placement for condition monitoring in complex systems, focusing on capturing dominant dynamic responses that indicate abnormal conditions. Traditional sensor placement methods often rely on costly distributed sensors and heuristic strategies, which are not efficient in capturing the most informative response characteristics. To address these challenges, a data-driven Design of Experiment (DoE) approach is proposed, leveraging system science principles to optimize sensor allocation systematically. The implementation of this framework is formulated as a sparse regression problem, enabling an efficient selection of sensor locations that maximize information gain while minimizing redundancy. To solve this problem, a newly developed Compressed Orthogonalized Least Squares (Comp-OLS) algorithm is introduced. In order to validate the proposed approach, a case study on the DoE of a Duffing system is conducted. Compared with the commonly used Pivoting QR Factorization (PQRF) method, the results demonstrate that the Comp-OLS-based framework significantly enhances sensor placement efficiency, ensuring comprehensive coverage of system dynamics while anchoring the locations of required sensors. This study demonstrates the potential of data-driven DoE for improving condition monitoring in various engineering applications, offering a scalable and effective solution for sensor placement challenges.

Invited Speech 19

Optimized convolutional neural networks using orthogonal array for concrete crack detection

Speaker **Tran Duc Manh**

Section *2 (Time: 10:55 – 11:05, August 07, 2025)*

Abstract

Convolutional Neural Networks (CNNs) currently hold a prominent position among the most effective methods for classifying images across a wide range of fields. In

construction, Convolutional Neural Networks (CNNs) is extensively applied for detecting concrete cracks, supporting structural health monitoring (SHM). However, selecting appropriate hyperparameters for models with a high expected accuracy poses a significant challenge. Although some recent techniques have demonstrated remarkable performance on common datasets, they have not consistently performed well on concrete crack datasets. This study presents a comprehensive Orthogonal Array Tuning (OAT) approach for selecting optimal hyperparameters of CNNs. Additionally, the obtained results from the proposed method are compared with those obtained by using Analysis of Variance and Turkey (ANOVA), and a different OAT method with varying hyperparameter factors.

Invited Speech 20

Predicting Building Energy Consumption Considering Climate Change using 6D BIM and Machine Learning

Speaker **Nguyen Tran Hieu**

Section 2 (Time: 11:05 – 11:15, August 07, 2025)

Abstract This paper proposes a framework that integrates 6D Building Information Modeling (6D BIM) with machine learning techniques to predict building energy consumption under different climate scenarios. Firstly, a machine learning model is trained using the dataset generated from the 6D BIM-based parametric study. Next, a regression model is constructed based on the simulation results with the weather data according to climate change scenarios RCP 2.6, RCP 4.5 and RCP 8.5. Combining two models allows for the forecasting of future building energy demand up to the year 2100. A case study of 2-storey private house in Hanoi is presented to illustrate the proposed framework. This research underscores the potential of advanced digital tools and data-driven methods to support building design and operation in an era of environmental uncertainty.

Section 3: Optimization and Machine learning in Engineering Problems

Important Speech 1

An adaptive DNN-assisted metamodel for damage detection of steel frames based on incomplete frequencies and mode shapes with limited training datasets

Speaker **Nguyen-Thoi Trung**

Section *3 (Time: 09:45 – 10:05, August 07, 2025)*

Abstract This study presents an adaptive metamodel approach, assisted by a Deep Neural Network (DNN), for damage detection in steel frames based on incomplete frequency and mode shape data with limited training datasets. The proposed method integrates model order reduction (MOR) and a multi-stage process to enhance efficiency and accuracy. Initially, the Modal Strain Energy Change Ratio (MSECR), calculated from incomplete modal data, is employed to eliminate low-risk damage candidates by leveraging a second-order Neumann series expansion-based MOR (NSEMR-II) technique. This significantly reduces the neural network architecture of the DNN model used in subsequent stages. The DNN is trained on frequencies and mode shapes simulated using the Finite Element Method (FEM), corresponding to measured degrees of freedom (DOFs). Iteratively refining damage candidates through a damage threshold, the method improves diagnostic accuracy while maintaining low computational demands and requiring only moderately sized datasets. The simplified DNN models effectively identify both the location and severity of damage using data from limited sensors, even under high noise conditions. Numerical examples on steel frame structures validate the approach's efficiency and practicality for structural health monitoring applications.

Invited Speech 21

Optimized Supervised Machine Learning for Accurate Estimation of Reinforcement in RC Beams and Columns

Speaker **Thai Duong Le**

Section *3 (Time: 10:05 – 10:15, August 07, 2025)*

Abstract In the era of Industry 4.0, technological advancements are transforming the construction industry through automation, artificial intelligence (AI), and data-driven decision-making. Traditional structural design methods, particularly for reinforced concrete beams and columns based on the Vietnamese Standard TCVN 5574:2018, involve multiple

manual calculations that, while effective, are time-consuming and labor-intensive. To address this limitation, this study proposes a Supervised Machine Learning (SML) approach to optimize reinforcement design for beams and columns. Using available datasets, the SML models can predict the required reinforcement area with high accuracy, achieving deviations of less than 10% for beams and 13% for columns. The application of SML in reinforcement estimation significantly reduces the time required for structural calculations. Moreover, it lays the foundation for future developments in automated structural design processes through seamless integration with architectural and structural design software and programming environments such as REVIT, ETABS/SAP2000, and MATLAB.

Invited Speech 22

Optimization of sensor locations for homogeneous beams in structural health monitoring using isogeometric analysis and differential evolution

Speaker **Lieu Minh Quan**

Section *3 (Time: 10:15 – 10:25, August 07, 2025)*

Abstract This work introduces a numerical approach to the optimization of sensor placement for homogeneous beams in Structural Health Monitoring (SHM). In which, the displacements through the beam height are represented by a generalized shear deformation theory (GSDT) based on the third-order polynomial function. Meanwhile, the displacement through the beam length is approximated by B-spline functions within the Isogeometric analysis. Accordingly, the position of measurement sensors concerning degrees of freedom (DOFs) defined at control points is determined by maximizing the sum of the terms in the Modal Assurance Criterion (MAC) which is built by eigenvectors obtained by the full model and a model order reduction (MOR) utilizing the second-order Neumann series expansion (SNSE). Differential Evolution (DE) is utilized as an optimizer. A simply supported beam is investigated to illustrate the current methodology ‘s reliability. Obtained results have indicated that the current paradigm can be utilized for the optimization sensor locations of other structures with potential applications to the SHM.

Invited Speech 23

Truss Structure Optimization Using the Portia Spider Algorithm: A Bio-Inspired Approach

Speaker **Thuy Dung Dau**

Section *3 (Time: 10:25 – 10:35, August 07, 2025)*

Abstract Optimizing truss structures is essential in civil engineering, aiming to reduce weight and support sustainable, high-efficiency designs. In this study, the Portia spider algorithm (PSA) is introduced as a novel optimization algorithm specifically designed for truss design problems with sizing constraints and continuous variables. PSA integrates advanced solution modification strategies to effectively address the inherent complexity of truss structure optimization. The algorithm's performance was thoroughly evaluated through extensive testing on 25-bar truss structures. The findings indicate that PSA consistently yields superior truss designs compared to other swarm-based techniques, achieving significant weight reductions and enhanced design quality. By offering a robust and computationally efficient solution for truss optimization, PSA demonstrates considerable potential to advance the field of structural optimization. These results highlight PSA as a valuable resource for civil engineers seeking to improve structural performance and efficiency, ultimately contributing to more sustainable construction systems.

Invited Speech 24

A Multiverse Optimizer for Time-Cost Trade-Off of Vehicle Routing Problem

Speaker **Van Nam Nguyen**

Section *3 (Time: 10:35 – 10:45, August 07, 2025)*

Abstract This paper proposes a novel strategy for solving the vehicle routing problem with capacity constraints by applying the Multiverse Optimizer (MVO) algorithm. Inspired by the principles of the multiverse theory, MVO simulates the movement of candidate solutions through metaphorical white holes, black holes, and wormholes to enhance the exploration and exploitation processes. The white hole mechanism supports global exploration, while the black hole and wormhole components help refine and converge toward optimal routes. The proposed method enables a practical trade-off between delivery time and operational costs, making it suitable for real-time logistics planning. A case study involving 20 customer locations illustrates the effectiveness of the approach, achieving a total delivery duration of 4.4 hours and an overall cost of $261.59.

Invited Speech 25

Multi-damage identification in three-dimensional frame structures via a combined MSE-based method and PSO algorithm

Speaker **Van Sy Bach**

Section *3 (Time: 10:45 – 10:55, August 07, 2025)*

Abstract This paper presents a multi-damage identification approach for three-dimensional frame structures that combines the modal strain energy (MSE)-based method with the particle swarm optimization (PSO) algorithm. Firstly, the potential damage locations are identified by the modal strain energy-based index (MSEBI). This index is calculated from the difference in the MSE values of the elements corresponding to the two states prior to and after the damage's occurrence. In order to improve accuracy and reduce the limitations of the noise elements in determining damage location, the MSEBI index is determined from the first six vibration mode shapes. Secondly, the PSO with a function of objective variables based on the vibration modal strain energy (MSE) values determines the damage level of the elements identified in the first step. The accuracy and reliability of the proposed method are evaluated by analyzing a four-story three-dimensional frame structure with 63 elements, considering three different damage scenarios. The obtained results confirm that the proposed method accurately identifies the location and severity of multi-damage in the three-dimensional frame structures.

Invited Speech 26

An advanced metaheuristic framework for time–cost–quality optimization in complex construction projects

Speaker **Khanh - Nhan Tran**

Section *3 (Time: 10:55 – 11:05, August 07, 2025)*

Abstract Contemporary construction projects demand a holistic management approach that does not balance time and cost only but preserve quality under uncertain conditions also. Traditional methods often emphasize time-cost trade-offs, overlooking the intricate link between task sequencing and quality outcomes. To address these limitations, this paper introduces a novel optimization framework combining the multi-objective sea-horse optimizer (MOSHO), the root assessment method (RAM), and fuzzy logic, specifically designed for time-cost-quality trade-off (TCQT) scenarios. The proposed model was tested against established algorithms—MOSGO, MOSOS, and NSGA-III on real-world construction data. Results demonstrate that the integrated MOSHO-RAM-Fuzzy logic

approach outperforms the conventional mentioned techniques. This consistently generates well-distributed solutions that effectively reconcile cost efficiency, project duration, and product quality. This integrated model also serves as a robust decision-support tool in the context of involving multiple execution alternatives, particularly suited to the scheduling phase of large-scale projects where uncertain parameters significantly impact construction project outcomes.

Invited Speech 27

Damage detection of trusses utilizing free vibration signals and Convolutional neural network relied on model order reduction

Speaker **Tan T. Nguyen**

Section *3 (Time: 11:05 – 11:15, August 07, 2025)*

Abstract This study presents an approach for damage quantification of trusses utilizing free vibration signals and Convolutional neural network (CNN) relied on model order reduction (MOR). The input data consists of the values of eigenvectors extracted from several important degrees of freedom (DOFs) instead of all ones, collected from numerical simulations under various random damage scenarios. The output is the truss members' randomly assumed damage ratios. The Modal strain energy-relied index (MSEI) is applied to eliminate members with a low probability of damage, aiming to reduce the data dimension for CNN. Thereby, its accuracy of predicting the damage detection is improved with the capability of automatically extracting features from CNN, this method significantly reduces the computational cost in training and testing compared to traditional methods. The methodology is validated on a 2D truss model under two damage scenarios programmed in Python. The results are promising for providing the method's potential applications to structural health monitoring (SHM).

Section 4: Advances in Construction Management

Important Speech 2

Strategies to Achieve Sustainable Concrete Waste Recycling

Speaker **Thanwadee Chinda**

Section *4 (Time: 13:35 – 13:55, August 07, 2025)*

Abstract With limited spaces in big cities, many outdated buildings and houses are demolished to rebuild new residential units, causing a high amount of concrete waste. In Thailand, most concrete waste is illegally disposed of, causing several environmental impacts. Concrete waste recycling may be a solution to minimize these impacts. However, the feasibility of establishing concrete waste recycling plants must be considered carefully to plan for suitable strategies. This study utilizes the system dynamics (SD) modeling approach to examine strategies, related to economic, environmental, and social perspectives, for concrete waste recycling plant establishment. Benefits and costs of the project are considered, such as savings in virgin materials, savings in carbon tax, job creation, and labor, production, and health-related costs. The simulation results reveal that it takes 17 years for the project to achieve the minimum acceptable internal rate of return of 12%. Various strategies are performed to achieve sustainable implementation. The results reveal that labor cost, landfill charge, and business opportunity are crucial for successful concrete waste recycling. The government and construction industry may use study results to plan for concrete recycling implementation to achieve sustainable development.

Invited Speech 28

Geotechnical Risk Management in Pipe-Jacking Construction Using Fuzzy-FMEA: A Case Study of the Yen Xa Sewerage System Project

Speaker **Giang Vu-Thi-Thuy**

Section *4 (Time: 13:55 – 14:05, August 07, 2025)*

Abstract Pipejacking, a trenchless construction technique for installing underground pipelines, helps minimize surface impacts in urban areas, especially in urban areas. However, this method faces many geotechnical challenges such as ground settlement and pipeline instability. This study applies Fuzzy Failure Mode and Effects Analysis (Fuzzy-FMEA) to improve risk management in underground jacking projects, focusing on the Yen Xa Drainage System Project in Hanoi, Vietnam. The results show that integrating Fuzzy-FMEA into a geotechnical

management framework is an important development, providing practical insights for urban jacking projects, improving construction safety and efficiency.

Invited Speech 29

Completion of the final settlement of public investment capital in construction in Vietnam

Speaker **Nguyen Thi Tuyet Dung**

Section *4 (Time: 14:05 – 14:15, August 07, 2025)*

Abstract

The final settlement of investment capital for completed projects represents one of the final and critical stages in the construction investment management process. For projects funded by public investment capital, this procedure is legally mandated upon project completion or when implementation is permanently terminated. In Vietnam, the regulatory framework governing the final settlement of public investment capital in construction has, to a large extent, fulfilled management requirements, eliminating expenditures that exceed prescribed norms, incorrect unit prices, and misapplied policy regimes-thereby contributing to savings in the state budget. Nevertheless, the process still encounters several challenges, including inadequacies in the legal documentation system, limitations in the capacity of project owners and contractors, and issues related to the decentralization of capital management-all of which negatively impact investment efficiency. Accordingly, this paper analyzes the current status of the final settlement of construction investment capital from public investment resources, identifying existing shortcomings and their underlying causes, and proposing recommendations aimed at enhancing the efficiency of public investment.

Invited Speech 30

Designing Pedestrian Streets in Hanoi to Reduce Greenhouse Gas Emissions

Speaker **Luong Tu Quyen**

Section *4 (Time: 14:15 – 14:25, August 07, 2025)*

Abstract

Hanoi faces significant challenges, including traffic congestion, air pollution, and climate change. In this context, planning and developing pedestrian zones is seen as a viable solution to reduce greenhouse gas emissions and save energy while enhancing urban environmental quality. Nevertheless, even within pedestrian areas, both direct and indirect emission sources exist due to ancillary activities. This paper proposes a series of urban design solutions for pedestrian areas in Hanoi to optimize energy

efficiency and reduce greenhouse gas emissions while meeting the functional and aesthetic requirements of a modern urban space.

Invited Speech 31 **Quantitative Assessment of Damage in Cementitious Beams via Acoustic Emission Technique (AET)**

Speaker **Tam Nguyen-Tat**

Section *4 (Time: 14:25 – 14:35, August 07, 2025)*

Abstract The purpose of this study is to contribute to a deeper understanding of degradation mechanisms in concrete, mortar, and cement-paste beams subjected to mechanical loading, through the application of the Acoustic Emission Technique (AET). To this end, displacement-controlled three-point bending tests were conducted on three notched beams of identical shape and dimensions. The objective was to establish correlations between damage modes observed during each loading cycle and the corresponding AE activity.

Invited Speech 32 **Toward Context-Aware AI Agent Integration in BIM for Ondol System Design and Maintenance Communication**

Speaker **Tran Van Tien Si**

Section *4 (Time: 14:35 – 14:45, August 07, 2025)*

Abstract Inspecting underfloor heating systems such as Ondol poses unique challenges due to their concealed nature, spatial complexity, and fragmented communication across stakeholders. Traditional inspection workflows often lack intelligent, context-aware planning, leading to inefficiencies and oversight during design and maintenance phases. To address this gap, this study introduces a novel framework that integrates a large language model (LLM)-based AI agent with Building Information Modeling (BIM) environments through the Model Context Protocol (MCP). The agent autonomously interprets spatial and parametric data within BIM, simulates inspection scenarios, and supports context-sensitive decision-making. The framework utilizes CSV-based data storage to manage inspection metadata, enabling seamless information retrieval and updating. Inspection steps and contextual outputs are visualized directly within the Revit environment, offering intuitive feedback for inspectors and engineers. Validation was conducted through simulation and scenario-based evaluation, demonstrating the agent's potential in

automating inspection planning and enhancing communication across disciplines. This work lays the foundation for AI-augmented digital workflows in traditional HVAC system monitoring.

Invited Speech 33 **Improving the Management of Road Infrastructure Maintenance in Vietnam for the Period 2025 - 2030**

Speaker **Nguyen Thi Tuyet Dung**

Section *4 (Time: 14:45 – 14:55, August 07, 2025)*

Abstract Vietnam is facing the early deterioration of its bridge and road systems due to increased traffic volume, high temperatures, and heavy rainfall, while the funding for maintenance has not met the actual needs. During the period from 2013 to 2024, the Government implemented various comprehensive measures to enhance the effectiveness of maintenance activities, such as reforming management methods, strengthening planning efforts, and increasing revenue sources for maintenance. However, several shortcomings still persist in this field. By reviewing domestic and international literature and analyzing the characteristics of road infrastructure that affect maintenance activities, this paper assesses the current state of maintenance in Vietnam from 2013 to 2024, along with identifying existing issues and limitations. Thereby this paper proposes several solutions to improve the management of road infrastructure maintenance in Vietnam for the period 2025 – 2030.

Invited Speech 34 **Pedestrian streets contribute to develop the low emission zone in Hanoi's inner area**

Speaker **Pham Thi Ngoc Lien**

Section *4 (Time: 14:55 – 15:05, August 07, 2025)*

Abstract Hanoi's inner area is facing serious challenges of climate change and air pollution is a core concern in here. The PM2.5 dust levels (the averaged level of monitoring stations) is higher than standard levels from 1.2 to 2 time. According to research, the number of dust levels can reach up to 150 μg/m³ in Hanoi, which is three times higher than the World Health Organization's (WHO), and it is 50 μg/m³ [2]. Thus, the city council has applied low emission zones in the inner city to improve the quality of urban environment, public health, create friendly living standards, which toward sustainable development and adapt climate change. The aim reduces the number of cars, encourages people to use public transportation and

walk instead of private vehicles. This study highlights the role of pedestrian streets as a key component in Hanoi's strategy to build effective low emission zones.

Invited Speech 35 **An Integrated Municipal Solid Waste Management Scheme for Carbon Footprint Reduction: Leveraging the Informal Sector in Hanoi**

Speaker **Take Kyoko**

Section *4 (Time: 15:05 – 15:15, August 07, 2025)*

Abstract Municipal solid waste (MSW) management in developing countries largely relies on open dumping and minimal sanitary landfilling, contributing significantly to greenhouse gas (GHG) emissions. The waste management sector is a global concern due to its impact on climate change, with inefficient collection systems and improper disposal exacerbating emissions. Despite its associated social and health issues, informal recycling plays a crucial role in reducing emissions. This study integrates findings from the JEAI Recycurbs Viet project with the Asia Low Carbon Society Research (LCSR) Study, utilizing the ExSS/Waste model to quantify GHG emissions in Hanoi under two scenarios: one without informal recycling (NIR_S) and the other one with informal recycling (IR_S). Results indicate that informal recycling reduces emissions by 3,000 tons of CO2 equivalents annually. Strengthening policies to integrate informal recycling into formal waste management systems can enhance environmental, social, and economic benefits.

Section 5: Advances in Architectural Design

Important Speech 3 **The Origins of the Wooden Structural Framework in the Traditional Architecture of Central Vietnam**

Speaker **Khuat Tan Hung**

Section *5 (Time: 13:35 – 13:55, August 07, 2025)*

Abstract One of the most distinctive elements of traditional Vietnamese architecture is its wooden structural framework. A prevailing belief holds that the traditional wooden frame used by the Vietnamese people is unified from north to south. It is assumed that, during the southward migration process, the Vietnamese carried their construction knowledge with them and gradually simplified the structural framework in their architectural practices. However, this notion does not adequately account for the significant differences between traditional architecture in Central Vietnam (south of Ngang Pass) and that of the

North. These differences span architectural form, spatial layout principles, construction techniques, and especially the methods employed in constructing wooden frameworks. Through morphological analysis, structural examination, and comparative methods, this study identifies key differences between the traditional wooden frames of regions north and south of Ngang Pass, thereby asserting their distinct indigenous origins.

Invited Speech 36

Solutions for developing the Tam Giang Lagoon- Hue in the context of climate change

Speaker **Chau Huynh Bao**

Section *5 (Time: 13:55 – 14:05, August 07, 2025)*

Abstract Climate change is a global issue that significantly impacts everything from natural ecosystems to socio-economic systems, human health, and well-being. In the development process, urban are both agents and the most severely affected objects of Climate change worldwide. Therefore, mitigation and adaptation are two aspects to consider in urban planning and development. One locality in Vietnam severely impacted by climate change and sea-level rise is the Dam Pha Tam Giang area in Thua Thien Hue province. This lagoon is the largest in Southeast Asia and among the largest in the world, with high biodiversity and a wealth of diverse resources. Dam Pha Tam Giang also plays a special role in the socio-economic development strategy for the Central region of Vietnam. The article will include assessing the current state of the Tam Giang Lagoon under the impacts of climate change and proposing principles and solutions for landscape organizations to respond to the risks of natural disasters.

Invited Speech 37

Landscape Architecture of Industrial Zones in Hanoi, Vietnam

Speaker **Le Thi Ai Tho**

Section *5 (Time: 14:05 – 14:15, August 07, 2025)*

Abstract Landscape architecture in Industrial zones (IZs) plays a vital role in enhancing aesthetics, improving microclimate conditions, and supporting sustainable development. However, in Hanoi, landscape planning and management in IZs remain inadequate due to the lack of clear standards, regulations, and effective oversight. This study analyzes the current state of landscape architecture across Hanoi's operational IZs through field surveys and

applied research methods. Based on the findings, the paper proposes organizational and management solutions to enhance landscape quality and environmental conditions in Hanoi's IZs.

Invited Speech 38 **A proposed spatial structure model for interactive museum exhibitions**

Speaker **Tran Ngoc Thanh Trang**

Section *5 (Time: 14:15 – 14:25, August 07, 2025)*

Abstract The increasing application of interactive technologies is transforming museum exhibition design from static displays to dynamic, user-centered experiences. This study proposes a spatial organization model for museum exhibitions, featuring six functional zones based on interaction characteristics and a flexible, multi-route layout structure to accommodate personalized visitor journeys. A mixed-method approach was employed, combining theoretical synthesis with case study analysis of five representative museums. The study contributes a theoretical design model for exhibition spaces, offering practical value for curators, architects, and museum designers in the context of digital transformation.

Invited Speech 39 **Application of the NSGA-II Algorithm for Optimizing Construction Site Layout Planning**

Speaker **Nguyen Xuan Thanh**

Section *5 (Time: 14:25 – 14:35, August 07, 2025)*

Abstract In the construction field, beyond studying construction methods and the performance of building materials, research on Construction Site Layout Planning (CSLP) is a crucial area of focus. Optimizing the placement of auxiliary facilities to minimize movement distances while enhancing safety represents a complex problem involving numerous variables. In this study, the Non-dominated Sorting Genetic Algorithm II (NSGA-II) is applied to enhance the planning of construction site layouts by tackling two main goals at once: reducing the distance of material and worker movements, and improving overall site safety. The method is utilized to generate a set of Pareto-optimal solutions that maintain diversity and offer a range of viable options. The findings indicate that the proposed approach performs effectively in identifying optimal trade-offs between the objectives. This research highlights the capability of NSGA-II in addressing complex,

multi-objective challenges in construction site planning and lays the groundwork for future exploration in this domain.

Invited Speech 40 **Promoting some traditional Vietnamese architectural and cultural values in the design of new coastal urban areas adapting to climate change**

Speaker **Nguyen Dinh Phong**

Section *5 (Time: 14:35 – 14:45, August 07, 2025)*

Abstract Vietnam is a country with a long history of development with traditional villages that have formed and developed stably for centuries, a concrete and vivid testament to the settlement methods and lifestyle of ancient Vietnamese people. This article selects and analyzes some prominent values of traditional Vietnamese architecture and culture. From there, the author proposes the viewpoint of inheritance in the design and planning of new coastal urban areas adapted to climate change.

Invited Speech 41 **Landscape architecture as a formative element in shaping Dalat's urban identity**

Speaker **Nguyen Thi Nhu Trang**

Section *5 (Time: 14:45 – 14:55, August 07, 2025)*

Abstract Formed in the early 1900s through carefully prepared urban planning projects, Da Lat once possessed a highly distinctive urban identity, reflected in its spatial structure and city image as well as in its landscape architecture and socio-cultural fabric. Tangible and intangible recognition elements played central roles in shaping Da Lat's urban image, contributing to its appeal among tourists and urban scholars, planners, and heritage researchers. However, like many rapidly developing tourist cities across Vietnam, Da Lat is now confronting the serious threat of losing its unique identity due to unregulated development. The study adopts a comprehensive methodological approach that integrates field surveys, expert interviews, and public perception assessments to identify the core elements shaping the urban identity of Da Lat. Ultimately, the paper emphasizes the role of landscape architecture as a fundamental and enduring value, contributing to the enhancement of the city's legibility, imageability, and long-term memorability. It further asserts that the preservation of landscape architecture is essential to reinforcing the integrity of Da Lat's urban identity.

Invited Speech 42

A Hybrid Model Combining Regression Analysis and Taguchi to Enhance the Utilization of Expert Knowledge in Tree Planning for Architectural Design

Speaker **Tran Le Anh**

Section *5 (Time: 14:55 – 15:05, August 07, 2025)*

Abstract Science and technology are advancing rapidly, while environmental conditions, climate, and human needs constantly change. As a result, practical knowledge from historical records, books, and scientific documents is often incomplete. Expert experience helps fill these gaps, but it is usually unstructured and based on empirical rules. This study develops a model that systematically integrates practical knowledge with empirical rules into a structured and user-friendly computational framework. The Taguchi orthogonal array method is applied to reduce the number of study cases while preserving essential information, overcoming the factorial method's limitations. This also facilitates structured questionnaire design for expert input. Additionally, regression analysis is used to develop predictive equations for architectural design variables based on practical and empirical data. By combining these methods, the model effectively bridges the gap between theoretical knowledge and expert intuition. Applied to green space planning in architectural design, the model provides a systematic approach to incorporating expert knowledge in cases without standardized guidelines. This enhances decision-making, ensuring more adaptable and effective solutions for tree planning in urban and architectural design.

Invited Speech 43

Energy Consumption Considering Climate Change using 6D BIM and Machine Learning

Speaker **Nguyen Tran Hieu**

Section *5 (Time: 15:05 – 15:15, August 07, 2025)*

Abstract This paper proposes a framework that integrates 6D Building Information Modeling (6D BIM) with machine learning techniques to predict building energy consumption under different climate scenarios. Firstly, a machine learning model is trained using the dataset generated from the 6D BIM-based parametric study. Next, a regression model is constructed based on the simulation results with the weather data according to climate change scenarios RCP 2.6, RCP 4.5 and RCP 8.5. Combining two models allows for the forecasting of future building energy demand up to the year 2100. A case study of 2-storey private house in Hanoi is presented to illustrate the

proposed framework. This research underscores the potential of advanced digital tools and data-driven methods to support building design and operation in an era of environmental uncertainty.

Section 6: Computational mechanics

Important Speech 4

An Analytical Approach for Free Vibration Analysis of Beams Considering Lateral Shear Strain Using Independent Displacement and Shear Force Variables

Speaker **Thanh Thuy Vu**

Section *6 (Time: 13:35 – 13:55, August 07, 2025)*

Abstract This study presents an approach to the free vibration analysis of beams, accounting for lateral shear strain through two independent variables: displacement y and shear force Q. The model builds upon the author's previously developed theory, A New Beam Theory Considering Horizontal Shear Strain, and yields vibration functionals expressed in terms of variables y and Q. This study employs the virtual load method, combined with the Lagrange multiplier method, to derive the characteristic polynomial for determining the natural frequencies. Additionally, the parameter optimization method is used to solve the eigenvalue problem under various boundary conditions. The proposed approach accurately captures the influence of lateral shear strain, which significantly affects the structural response of deep beams, short columns, and thick plates. Furthermore, this approach effectively eliminates the shear locking phenomenon, commonly encountered in analyses of structures considering shear strain.

Invited Speech 44

Experimental Study on The Combustion Properties of Glued Laminated Timber Structures

Speaker **Do Tien Thinh**

Section *6 (Time: 13:55 – 14:05, August 07, 2025)*

Abstract This study investigates the structural behavior of Glued Laminated Timber (GLT) through a comprehensive experimental program, including assessments of material properties, fire resistance, and mechanical performance. While GLT is widely used in countries like Japan, its application in Vietnam remains limited. Nonetheless, GLT offers key advantages such as a high strength-to-weight ratio, efficient use of wood resources, environmental sustainability, and architectural flexibility. To explore its potential in Vietnam's construction sector, a two-story prototype structure was built entirely with GLT. This

prototype serves as a test model to evaluate the real-world performance of engineered timber under local environmental conditions, providing a scientific basis for broader application in Vietnamese construction practices. Particular focus was placed on examining the combustion behavior of Japanese cedar GLT, with a series of standardized fire tests conducted to determine its compliance with Vietnam's fire safety regulations and its overall suitability for application in modern building practices.

Invited Speech 45

A new analytical proposal for evaluating torsional behavior of FRP-strengthened reinforced concrete beam based on modified-softened-variable-angle-truss model

Speaker **Vinh Sang Nguyen**

Section *6 (Time: 14:05 – 14:15, August 07, 2025)*

Abstract A new analytical method has been proposed to forecast the torsional behavior of reinforced concrete (RC) girder strengthened with fiber-reinforced polymer (FRP). The proposal was an enhanced modified-softened-variable-angle-truss model, considering the impact of FRP strengthening on concrete confinement alongside softened compressive and tensile behaviors in concrete. A database of 36 solid RC girders, strengthened with diverse FRP systems, was analyzed to evaluate the precision and dependability of the proposed model, considering an iterative trial-and-error algorithm. The results indicate agreement between experimental and analytical findings, confirming the RA-MSTMT-FRP model as a feasible method for forecasting torsional response.

Invited Speech 46

The effectiveness of the DMM method in ground improvement for stability during soil treatment

Speaker **Phu-Huan Vo Nguyen**

Section *6 (Time: 14:15 – 14:25, August 07, 2025)*

Abstract Ground improvement in southern Vietnam has been extensively studied and implemented in various port projects, with the deep mixing method (DMM) emerging as a relatively new technique applied in a few ongoing projects. In addition to enhancing slope stability, reducing settlement is also a primary objective of soft ground improvement. This research aims to evaluate the effectiveness of the DMM approach. Field mowing and data analysis were conducted to assess the method's performance and verify the quality of DMM piles combined with surface treatment. A full-scale test was performed

using a surcharge applied to the design load, enabling the verification of both elastic and long-term settlement. For comparison, a site utilizing the preloading method with prefabricated vertical drains (PVD) was also studied. The findings revealed that DMM piles significantly reduced vertical settlement and lateral movements by up to 95% compared to the PVD method. Additionally, the incorporation of surface treatment further decreased the stress concentration ratio due to an enhanced arching effect.

Invited Speech 47

Numerical investigation of kinetic pyrolysis in fire-exposed compressed Spruce panels

Speaker **Tran Trong Tuan**

Section 6 (Time: 14:25 – 14:35, August 07, 2025)

Abstract This study presents a numerical investigation into the fire resistance of thermo-mechanically densified Spruce wood using a kinetic pyrolysis model. Unlike conventional approaches that rely on simplified or generalized thermal degradation models developed for untreated bulk wood, this research emphasizes the necessity of incorporating the specific thermal decomposition behavior of wood's primary constituents (hemicellulose, cellulose, and lignin). The densification process significantly alters the wood's internal structure by reducing its moisture content and porosity, thereby changing its fire response characteristics. To accurately simulate these effects, a user-defined subroutine (UMATHT) was implemented in Abaqus to model heat transfer and material degradation under various heat flux conditions. The results demonstrate that the kinetic pyrolysis model provides a more realistic and reliable prediction of the degradation process in densified wood, offering valuable insights for fire-oriented design and performance-based safety assessments in structures utilizing engineered wood materials.

Invited Speech 48

Analytical and FEM Load-Deflection Behavior of Reinforced Concrete Beams Strengthened with a Combination of Fiber-Reinforced Cementitious Matrix and Fiber-Reinforced Polymer

Speaker **Pham Nguyen The Thanh**

Section *6 (Time: 14:35 – 14:45, August 07, 2025)*

Abstract This study focuses on establishing analytical and finite element models to determine the load-deflection behaviors that resulted by the combined strengthening effective of the combined of Fiber-Reinforced Cementitious Matrix

composite and Fiber-Reinforced Cementitious Matrix composite. In the model, a Fiber-Reinforced Cementitious Matrix is bonded to the soffit of the RC beam and Fiber-Reinforced Polymer layers are bonded to the soffit of the FRCM layer. Theoretical formulas are attained and enhanced to identify the load-deflection behaviors. Besides, finite element models are created using ABAQUS C3D8 and T2D2 element types. The concrete damaged plasticity model is used to predict the behavior of concrete under strain loading. The deflection path curves at soffit of the beam determined through both the theoretical model and FEM are reasonable agreement, with error margin of 3.79 to 9.01 percent in comparation with those in FEM models. The scope of application of the theoretical formulation and FEM has been proposed. Implications for research on the development of the theoretical formulation have been suggested.

Invited Speech 49

Micromechanical Analysis of Variable Angle Tow Composites Considering Uncertainties in Constituents

Speaker **Trang Le**

Section *6 (Time: 14:45 – 14:55, August 07, 2025)*

Abstract Fibre reinforced polymers are commonly used for hydrogen tanks, which operate under a range of temperatures, pressures, and levels of hydrogen permeation. This working environment can affect the mechanical properties of the composite mostly through the matrix. This study investigates the impact of uncertainties in constituents on the homogenised properties of fibre reinforced composite at the ply-scale. The uncertainties of the mechanical properties of individual carbon fibres and epoxy resin are incorporated into micromechanical analysis models to investigate the probabilistic distribution of the mechanical characteristics of unidirectional (UD) composites and variable angle tow (VAT) composites. The elastic moduli of composites determined from Ansys Representative Volume Element (RVE) models are compared to those derived from the rules of mixtures (ROM), modified rule of mixtures (MROM), Bridging micromechanics model, Halpin-Tsai, Mori-Tanaka, and macroscale experiments to verify the precision of simulations. The RVE models effectively predict the variation of UD and VAT stiffness. In addition, Young's modulus of the VAT ply shows the most sensitivity to the uncertainty of matrix and fibre where the fibre angles range from 0 to 20 degrees for Ex. Monte Carlo simulations for the UD composites show that E1 (Elastic modulus aligned

with the fibre) is more sensitive to the uncertainty of fibre while E2 (Elastic modulus transverse to the fibre direction) is more sensitive to matrix variations.

Invited Speech 50

Navier solution for static behavior analysis of smart FGP beams resting on Pasternak foundation and subjected to electro-mechanical load

Speaker **Do Minh Duc**

Section *6 (Time: 14:55 – 15:05, August 07, 2025)*

Abstract In this report, smart functionally graded porous beams (smart FGP beams), consisting of a host FGP core bonded with two piezoelectric faces and contacting with a two-parameter Pasternak elastic medium foundation, are introduced. Importantly, static behavior analysis of such beams under electro-mechanical loads utilizing the Navier solution is presented for the first time. The equilibrium equations are derived based on the virtual work principle in conjunction with the sinusoidal shear deformation beam theory. The displacement and potential fields are analytically determined by Navier solution. The reliability of the proposed approach is validated by comparison with previous results of other authors. The deflection and axial stress of the beams under different combinations of electrical and mechanical loads are examined. Additionally, effects of porosity coefficients and elastic foundation parameters on the static characteristic of the smart FGP beams are investigated and commented.

Invited Speech 51

The effectiveness of applying high-strength geotextile on top of timber piles for foundation reinforcement

Speaker **Phu-Huan Vo Nguyen**

Section *6 (Time: 15:05 – 15:15, August 07, 2025)*

Abstract Currently, timber piles are a widely used material in Southern Vietnam for reinforcing weak soil foundations prior to construction. However, Vietnam has not yet established any standards or guidelines for the design and calculation of this method, with most applications relying on empirical knowledge. In practical construction, a sand layer is typically placed on top of cừ tràm to enhance its performance, but there has been no specific research conducted on this practice. In this study, based on the results of static load testing on timber piles foundations, the authors evaluate the method using finite element analysis for comparison. Furthermore, the study proposes an enhancement to the efficiency of timber piles by

incorporating a layer of high-strength geotextile above the timber piles. This research provides valuable insights for optimizing timber piles-based foundation reinforcement methods and suggests a practical approach for improving construction efficiency on weak soil.

Section 7: Advances in Structural Engineering

Important Speech 5

Modeling Truss Structures with Initial Length Imperfections Using Hybrid Finite Element Approach

Speaker **Tran Thi Thuy Van**

Section *7 (Time: 15:30 – 15:50, August 07, 2025)*

Abstract This study analyzed the dynamic response of truss structures with initial length imperfections under harmonic loading. A novel hybrid finite element method was developed, using both displacements and internal forces as unknowns in equations derived from the principle of virtual work. Imperfections introduced geometric nonlinearity, addressed through an incremental-iterative algorithm. Simulations showed accurate, efficient results for nodal displacements and internal forces. Even small imperfections significantly impacted dynamic behavior, highlighting their importance in nonlinear analysis and design.

Invited Speech 52

Enhancement of Mechanical Performance of Cement Pastes Prepared with Concrete Reclaimed Water Using CO2 Intermixing

Speaker **Tuan Minh Ha**

Section *7 (Time: 15:50 – 16:00, August 07, 2025)*

Abstract This study investigates the effects of CO2 intermixing on the fresh and hardened properties of cement pastes made with concrete reclaimed water. The reclaimed water, sourced from a construction site and stored for 30 days, was used to completely replace potable water in the cement paste preparation. The mixing process involved introducing CO2 in varying amounts (0 to 1.2% of total cement weight) into cement pastes made with reclaimed water. Five cement paste formulations were studied: a control sample using potable water and four samples using reclaimed water with different CO2 doses. The fresh properties of the cement pastes were evaluated through flowability and rheological tests, while the hardened properties were assessed by compressive strength and hydration heat measurements. The results showed that

using reclaimed water slightly reduced the flowability of cement pastes, with a notable increase in rheological properties. Higher CO2 doses intensified this effect due to the accelerated hydration kinetics from carbonation reactions that formed CaCO3. Hydration heat patterns were similar between samples made with potable and reclaimed water, with 0.3% and 0.6% CO2 significantly increasing hydration heat, while 1.2% CO2 reduced it. The compressive strength of samples with 0.3% and 0.6% CO2 was 10% higher than the control at 28 days. However, the 1.2% CO2 dose caused a 15% decrease in compressive strength, likely due to hydration inhibition. These findings suggest that CO2 intermixing can enhance the mechanical properties of cement pastes made with reclaimed water, with optimal CO2 doses around 0.6%.

Invited Speech 53

A Hybrid Whale Optimization Algorithm Approach for Efficient Bottled Water Distribution

Speaker **Nguyen Van Nam**

Section *7 (Time: 16:00 – 16:10, August 07, 2025)*

Abstract This study aims to construct an optimized distribution schedule for bottled water suppliers. The study introduces the Hybrid Whale Optimization Algorithm (HWA), which integrates three core search mechanisms: migration, priority selection, and prey enrichment, along with opposition-based learning and mutation-crossover methods. Its effectiveness has been validated through evaluations using 23 standard functions and a real-world case study focusing on water distribution in Vietnam. The results show that HWA is a powerful decision support tool that effectively facilitates optimal decision-making processes in water distribution path management.

Invited Speech 54

Influence of sample shape and compaction energy on the compressive strength of slag-RCC prepared using the modified Proctor test

Speaker **Vinh Nguyen Quang**

Section *7 (Time: 16:10 – 16:20, August 07, 2025)*

Abstract Modal Analysis (MA) techniques are considered to have made significant contributions in modern fields, including aerospace, mechanical, and civil engineering, especially in the Structural Health Monitoring (SHM). The main task of MA is to perform analysis based on measurement data such as vibration responses and desired outputs suitable for condition monitoring objectives based on vibration features. In this study, the modal vibration modes of a

multi-storey building model were experimentally investigated and analyzed using the Frequency Domain Analysis technique (FDD). The multi-storey building model is modeled into Multiple Degree of Freedom (MDOF) systems with generalized coordinates in the lateral direction along with theoretical dynamic parameters for the purpose of determining the initial natural frequencies by the eigenvalue method. Experimental measurements are utilized to identify the modal frequencies, which are then compared to theoretical results. Experiments are conducted using Low-Cost Sensors MPU6050 in conjunction with a cost-effective Arduino system designed for simplicity and cost-effectiveness while ensuring reliable results. Consequently, the FDD technique is utilized to determine the vibration characteristics as modal parameters. The results from FDD are integrated with the Stabilization Diagram (SD) and compared with the theoretical problem to evaluate the sensor's and the model's reliability.

Invited Speech 55

Determination of Wind Load on High-Rise Buildings by Wind Tunnel Test in Vietnam

Speaker **Vu Thanh Trung**

Section 7 (Time: 16:20 – 16:30, August 07, 2025)

Abstract As buildings in Vietnam become increasingly taller and more architecturally complex, the application of current Vietnamese and international wind loading standards has proven inadequate in many design scenarios. In response, wind tunnel testing has gained prominence as a modern and effective method for accurately determining wind loads in structural design. This technique not only enhances the reliability of wind load assessments but also contributes to improved design efficiency and reduced construction costs. Typically, wind loads determined through wind tunnel testing are 20% to 30% lower than those estimated using conventional code-based methods. This paper presents a comprehensive review of wind tunnel testing applications carried out over the past decade at the Vietnam Institute for Building Science and Technology.

Invited Speech 56

Silica Effects on Properties of Portland Cement Used in Oil Well Construction

Speaker **Mai Thanh Pham**

Section *7 (Time: 16:30 – 16:40, August 07, 2025)*

Abstract This paper presents the finding of a study investigating the effects of silica additive on certain properties of Hoang

Thach Portland cement and evaluates its suitability for oil well construction at a depth of 1000 meters. In this study, silica was added to the cement in varying proportions from 0 to 25% by mass. The results indicate that as the silica content increased, the water requirement of the mixtures gradually rose, while the slurry density slightly declined. At a curing temperature of 52oC, both the initial and final setting times of the cement paste decreased, and the 1-day compressive strength of the hardened samples increased sharply. Notably, sample M3, containing 15% silica, achieved the highest compressive strength, 1,28 MPa – approximately three times higher than that of the reference sample. However, under standard conditions, the strength of silica-modified samples dropped significantly. These results suggest that Hoang Thach Portland cement, when combined with an appropriate amount of silica, can be effectively used in oil well construction.

Invited Speech 57

An enhanced algorithm for segmenting point clouds into clusters based on Euclidean distance

Speaker **Tran Thanh Ha**

Section *7 (Time: 16:40 – 16:50, August 07, 2025)*

Abstract This paper introduces an enhanced algorithm for segmenting point clouds into clusters based on Euclidean distance. By considering Euclidean distance— a simple and powerful geometric measure—we introduce a new method that not only outperforms previous methods in segmentation accuracy but also handles the scale sensitivity issue of existing Euclidean distance-based work. Our experiments demonstrate that our improved algorithm has a greater ability to accurately segment complex point cloud data, representing significant progress in the algorithm and the application of the field. By exploring segmentation process's different approaches and presenting an advanced algorithm, this paper makes a contribution to the evolution of the point cloud processing, providing valuable knowledge and valuable tool for both researchers and practitioners. Results demonstrate that the performance of clustering is enhanced by the proposed algorithm as opposed to the other algorithms.

Invited Speech 58	**Detectability Analysis of Structural Defects Using Lamb Waves: A Frequency-Based Approach for Structural Health Monitoring**
Speaker	**Juan Pablo Brazalez Reinoso (online)**
Section	*7 (Time: 16:50 – 17:00, August 07, 2025)*
Abstract	Structural Health Monitoring (SHM) plays a crucial role in ensuring the integrity and longevity of aerospace structures. This study investigates the detectability of structural defects using Lamb waves, focusing on the impact of defect size on wave propagation characteristics. Numerical simulations were conducted on an aluminum plate embedded with a sensor-actuator network, evaluating the interaction of fundamental Lamb wave modes (A0 and S0) with defects of 2mm, 4mm, and 8mm in diameter. Frequency spectrum analysis revealed that larger defects lead to significant energy attenuation, spectral shifts, and mode conversion, particularly influencing the dispersive nature of the A0 mode. Detectability maps derived from FFT energy loss highlight the sensitivity of different sensor locations to damage, demonstrating that defect size and wave scattering influence signal degradation. The findings confirm that Lamb wave-based SHM effectively enables early defect detection and damage quantification. The results support the optimization of sensor placement and excitation frequency selection to enhance defect characterization.

Section 8: Engineering management

Important Speech 6	**Sustainable Construction Contractors Selection using EDAS**
Speaker	**Phong Thanh Nguyen**
Section	8 (Time: 15:30 – 15:50, August 07, 2025)
Abstract	Selecting a sustainable construction contractor with sufficient capacity and experience is one of the critical factors in ensuring the quality and effectiveness of school construction projects. However, this selection process is often challenging due to its multi-criteria nature and inherent uncertainties in evaluation. This multi-criteria nature makes contractor selection a complex decision problem requiring systematic evaluation of trade-offs. This paper applies the Evaluation based on Distance from Average Solution (EDAS) to evaluate and rank construction contractors for a school construction project in Ho Chi Minh City. Through a comprehensive review of domestic and international literature and construction expert interviews, the study identifies 26 core criteria for

selecting a sustainable construction contractor of school projects. The research findings contribute to systematizing essential criteria for contractor evaluation while proposing a novel contractor selection method grounded in both scientific and practical foundations. This approach enhances the efficiency and objectivity of the decision-making process, assisting project owners and managers in the education sector in making optimal contractor selection decisions.

Invited Speech 59

Current Situation, Challenges, and Some Proposals for Developing the BOT Contract Investment Model in Road Transportation in Vietnam

Speaker **Le Viet Hoa**

Section *8 (Time: 15:50 – 16:00, August 07, 2025)*

Abstract In Vietnam, Public-Private Partnership (PPP) models are encouraged in road transportation infrastructure investment, with the Build-Operate-Transfer (BOT) contract being the most applied form. This type of contract plays a crucial role in the development of road transportation, especially in the context of limited state budget resources and the gradual reduction of Official Development Assistance (ODA) funds. However, BOT investment has recently shown signs of stagnation. This paper examines the current situation, identifies the challenges faced in BOT contract investments in road transportation in Vietnam, and analyzes the influencing factors. Based on these findings, several recommendations are proposed to further develop this investment model.

Invited Speech 60

Evaluating Critical Success Factors for Construction Projects: A Case Study in Vietnam

Speaker **Hoang Le Yen Nhi**

Section *8 (Time: 16:00 – 16:10, August 07, 2025)*

Abstract Vietnam's construction sector plays a crucial role in economic growth but faces various challenges such as ineffective project management and lack of sustainability. This study identifies and categorizes critical success factors (CSFs) to enhance management efficiency and promote sustainable development in Vietnamese construction projects. Data were collected from a survey of 192 participants conducted between July and December 2024. Initially, 36 CSFs were identified through a comprehensive literature review and expert interviews,

then analyzed using exploratory factor analysis (EFA), which grouped them into six main groups. The results highlight the importance of organizational capability, project management, sustainability, technology, and infrastructure. The study offers practical insights to help construction enterprises improve management practices, optimize resource allocation, and pursue long-term development goals.

Invited Speech 61

Investigating Sustainable Criteria for Site Selection of Construction WasteWater Treatment Plant: A Case Study in Ho Chi Minh City

Speaker **Tran Thanh Ha**

Section *8 (Time: 16:10 – 16:20, August 07, 2025)*

Abstract This study aims to identify and prioritize key criteria for the site selection of construction wastewater treatment (WWTP) in Ho Chi Minh City. A comprehensive literature review was conducted to establish a preliminary list of 27 criteria, which were then evaluated through expert surveys using a five-point Likert scale. The Relative Importance Index was applied to quantify the significance of each criterion. The results identified seven criteria as highly important: proximity to water bodies, proximity to human settlements, land use/land cover, proximity to protected areas, proximity to roads, slope, and soil type. These findings provide a basic review of sustainable criteria in selecting WWTP sites that align with the Sustainable Development Goals of HCMC. While the study is limited by a small expert sample and the absence of spatial analysis, it contributes valuable insights for urban infrastructure planning in similar developing contexts.

Invited Speech 62

Efficient Resource Leveling in Multi-Project Scheduling Environment with an Integrated Mountain Gazelle Optimizer and Opposition-Based Learning

Speaker **Thuy Dung Dau**

Section 8 (Time: 16:20 – 16:30, August 07, 2025)

Abstract Construction enterprises often undertake multiple projects simultaneously, necessitating the efficient allocation of shared resources while ensuring adherence to project deadlines. Addressing this challenge requires advanced optimization techniques to achieve resource balance. This study introduces an improved mountain gazelle optimizer

(iMGO) incorporating opposition-based learning (OBL) mechanism to enhance search efficiency and solution diversity. By simultaneously evaluating candidate solutions and their opposite counterparts, iMGO mitigates premature convergence and optimizes the exploration-exploitation trade-off. A construction case study is used to validate the effectiveness of the proposed algorithm, demonstrating its superior performance in achieving optimal resource leveling compared to benchmark algorithms. Experimental results indicate that iMGO not only attains optimal solutions but also exhibits greater stability and consistency across multiple trials. These findings highlight the potential of the developed approach to enhance resource management efficiency in complex multi-project environments.

Invited Speech 63

Modeling Relationships between BSC-Oriented Attributes and Challenge Factors to Contractors' Sustainability Productivity Management

Speaker **Nguyen Le Minh Long**

Section *8 (Time: 16:30 – 16:40, August 07, 2025)*

Abstract This study aims to develop an innovation model for contractors' sustainability productivity management (CSPM). The Delphi method is based on the KAMET rules to validate the proposed criteria. Semi-structured interviews with industry experts were conducted to refine the model, ensuring its feasibility and relevance in the real world. Developing a comprehensive model through the Balanced Scorecard (BSC) framework. It emphasizes BSC perspectives as a sustainable approach in CSPM. The study also points out some critical challenges that need fixing to make construction more environmentally friendly, including limited technology, limited funds, and workers who cannot change their ways of doing things. This model contributes academically and practically by offering a structured framework for integrating sustainability into contractor productivity management. It provides valuable insights for universities, industry professionals, and policymakers, equipping future construction leaders with sustainable strategies. Moreover, the study contributes to changing the public's perception of the construction industry as not only a resource-intensive and ecologically harmful sector but also has many ways to integrate sustainable development with improving productivity through a harmonious balanced approach between profits, corporate environmental responsibility (CER) and corporate social responsibility (CER) to ensure that development does not compromise

and does not harm the interests of future generations, although limited, but the model found in this study is an essential step so that further studies can develop real-world empirical research by adapting to in line with the characteristics of the globalization trend of today's construction activities.

Invited Speech 64

What are the risky behaviors of residents when driving? And do stress, mental fatigue, and anxiety affect them?

Speaker **Chanh Toan Pham**

Section *8 (Time: 16:40 – 16:50, August 07, 2025)*

Abstract In developing countries, infrastructure and public transportation systems remain limited, and road traffic accidents are predominantly caused by motorcycles. A major contributing factor to these accidents is risky behavior. Such behaviors can be observed across various demographic groups but are most prevalent among young adults. In public health research, beyond cognitive factors and self-confidence, psychological well-being plays a critical role in the emergence of these behaviors. Additionally, external conditions such as weather also influence the likelihood of engaging in risky driving behaviors. This study aims to explore and synthesize the types of risky behaviors commonly exhibited by motorcycle riders, while also examining whether weather factors, and psychological stressors affect the likelihood of these behaviors. The study utilized data from 122 residents in Vietnam. Analyses were conducted based on frequency and Z-score methods. Results indicate that running red lights, using mobile phones while driving, and not wearing helmets are among the most common risky behaviors. Furthermore, individuals who had near-collisions or actual accidents tend to experience higher levels of stress in daily life.

Invited Speech 65

The Influence of Health Conditions and Psychoactive Substances on the Intention to Use Metro

Speaker **Cong Hau Truong**

Section *8 (Time: 16:50 – 17:00, August 07, 2025)*

Abstract The development of metro lines is a global trend, playing a crucial role in enhancing safety, accessibility, and reducing air pollution and traffic accidents. An improved urban environment contributes to the creation of

sustainable communities, supporting both the physical and mental well-being of residents in areas surrounding metro stations. Encouraging people to use the metro for their daily commutes is considered a key factor in determining the success of TOD projects in urban areas, especially in contexts where communities are transitioning to metro-based transportation. This study employs the two-step clustering analysis and decision tree model to analyze the relationship between health conditions and psychoactive substance uses in a sample of 300 residents in Ho Chi Minh City, Vietnam, to explore their intention to use the metro. The findings provide valuable insights into the integration of public health considerations within the transportation sector, contributing to the development of sustainable communities. Additionally, the research lays the groundwork for proposing solutions to increase public transport usage and support vulnerable social groups.

Section 9: Structural mechanics

Important Speech 7

A hybrid phase-field model for anisotropic brittle and ductile fracture in advanced materials

Speaker **Nhon Nguyen-Thanh**

Section *9 (Time: 15:30 – 15:50, August 07, 2025)*

Abstract Modeling fracture behavior in composite materials through numerical simulations is challenging due to the heterogeneity introduced by reinforcements. To overcome this, we propose a hybrid phase-field model that captures diverse cracking behaviors, encompassing both brittle and ductile fracture mechanisms in advance materials. The crack driving force is derived from the combined contributions of fibers and the matrix. To improve computational efficiency, we employ an isogeometric-meshfree approach for the numerical implementation of the phase-field model within a staggered computational framework. Additionally, the hybrid modeling framework is enhanced with a spatially adaptive refinement technique, incorporating gradient-based error estimators and field transfer operators. Simulation results demonstrate that the present approach effectively predicts complex failure patterns in both homogeneous and composite materials. Furthermore, it efficiently captures intricate ductile fracture phenomena, including plastic localization, crack initiation, propagation, and coalescence.

Invited Speech 66

Theoretical solution of the Timoshenko beam layed on the foundation subjected to dynamic load

Speaker **Le Hung Tran**

Section *9 (Time: 15:50 – 16:00, August 07, 2025)*

Abstract This research presents an analytical framework for studying the forced vertical vibrations of rails in ballasted tracks subjected to dynamic loading. The rails are modeled as infinitely long, uniform beams following Timoshenko beam theory, supported by a periodic arrangement of discrete elements. Each support is characterized as a beam resting on a viscoelastic foundation. By employing the frequency-domain Green's function, a direct linear correlation is derived between sleeper displacements at the rail contact points and the resulting reaction forces. This correlation allows the support system to be simplified as an equivalent stiffness spring. Incorporating this relationship into the periodic rail-support model, the vertical vibration response of both rails is analytically determined. The developed model facilitates efficient computation of rail dynamics under different loading scenarios, especially in asymmetric cases. Furthermore, the study compares rail responses obtained from two distinct beam theories. Emphasis is placed on examining resonance peaks in frequency response spectra, offering a deeper understanding of the mechanisms driving rolling noise generation.

Invited Speech 67

Buckling Reliability of Composite Cylindrical Shells for Hydrogen Storage: Influence of Stacking Sequence and Material Property Variability

Speaker **Luan Trinh**

Section *9 (Time: 16:00 – 16:10, August 07, 2025)*

Abstract The buckling reliability of composite cylindrical shells under axial compression is examined, with particular attention to laminate stacking sequence and variability in material properties due to operational conditions such as hydrogen storage. Two laminate configurations, Z32 and Z33, are analysed using both analytical buckling formulations and finite element (Abaqus) simulations. The analytical model is implemented in MATLAB and validated against eigenvalue buckling predictions from Abaqus.

Invited Speech 68

Identifying Nonlinear Output Frequency Response Functions using Generalized Associated Linear Equations with Recursive and Coupled Computational Methods

Speaker **Wenbo Zhang**

Section 9 (Time: 16:10 – 16:20, August 07, 2025)

Abstract

The non-linear output frequency response functions (NOFRF), as an extension of the linear frequency response function (FRF) in the non-linear case, has been applied to weakly non-linear system study and engineering structural health monitoring (SHM). The computation of NOFRFs requires first solving a series of linear ordinary difference equations, i.e., generalized associated linear equations (GALEs), and then obtaining the system's results of each order according to the definition of NOFRFs in the frequency domain. However, in practical applications, the solution of GALEs often requires the aid of numerical integration. Therefore, accurate numerical computation of GALE is the first task in system analysis using NOFRFs. In our study, two different numerical methods are proposed for solving the system of linear differential equations of GALEs. The first computational method involves solving the GALEs of each order using a Recursive Computational Method (RCM). The second approach transforms the problem of solving GALEs into state-space equations, which are then solved using the integral solver of numerical computation software (e.g., MATLAB). This method is referred to as the coupled computational method (CCM). Finally, we compare the results of the two methods for computing NOFRFs using a non-linear differential equation (NDE) model with a fourth-order nonlinear term as an example. The final results show that the two methods give consistent results for low order NOFRFs. However, for higher order NOFRFs, CCM produces more accurate results than RCM. This provides ideas for calculating NOFRFs by GALE in nonlinear systems and also provides an important theoretical basis for calculating NOFRFs in multiple-input multiple-output (MIMO) systems.

Invited Speech 69

Investigate the influenced parameters for exterior RC joint behavior by ABAQUS

Speaker **Nguyen Viet Phuong**

Section *9 (Time: 16:20 – 16:30, August 07, 2025)*

Abstract

Exterior reinforced concrete (RC) beam-column connection is one of the most crucial zones in a reinforced concrete moment resisting frame. The details of some

parameters within this joint can affect to its behavior and greatly influences the strength and ductility of overall frame. In this research, parameter studies of three-dimensional models were studied by finite element ABAQUS software for exterior RC joint subjected to monotonic loading. These studies involving thirty specimens were conducted to investigate the influence of concrete strength, anchorage length, anchorage shape of reinforcement and stirrup occurence within the joint panel. The studied results indicated that the addition of beam or column stirrups within joint panel, the concrete strength and anchorage shape can affect the joint behavior in some specified cases. The influence of anchorage length is not considered when its value is less than the one given in TCVN 5574-2018.

Invited Speech 70

Numerical Modelling of Densified Wooden Nails in Timber Assemblies Using Abaqus

Speaker **Nguyen Le Thuy**

Section *9 (Time: 16:30 – 16:40, August 07, 2025)*

Abstract This study presents a numerical investigation of densified wooden nails as a sustainable fastening solution in timber construction. Using Abaqus finite element software, a detailed model of a glulam timber assembly joined by densified beech nails was developed. The model accounts for material anisotropy, frictional interaction, and load-slip behavior observed in physical testing. Results demonstrate the ability of densified wooden nails to provide sufficient shear resistance and structural integrity while enabling compatibility with wood-based substrates. The numerical predictions are consistent with experimental findings and contribute to the broader application of bio-based fastening systems in both new construction and heritage restoration.

Invited Speech 71

Influence of specimen shape and compaction energy on the compressive strength of slag-RCC prepared using the modified Proctor test

Speaker **Le Chau Tuan**

Section *9 (Time: 16:40 – 16:50, August 07, 2025)*

Abstract This study examines the compressive strength of roller-compacted concrete (RCC) incorporating ground granulated blast-furnace slag (GGBS) using the modified Proctor compaction method. GGBS replaced cement at

four levels: 15%, 30%, 45%, and 60%, producing slag-RCC mixtures. These mixtures were compacted in cylindrical and cubic molds using a Proctor hammer to evaluate the influence of sample shape on compressive strength. Additionally, low and high compaction energy levels were applied to assess their effects. Results showed that the conversion coefficient from cylindrical to cubic specimens was lower for slag-RCC than for conventional RCC. The conversion coefficient decreased with increasing compressive strength, depending on the strength level. Increasing compaction energy by 100% led to approximately a 10% increase in compressive strength, while reducing energy by 50% resulted in a similar 10% decrease.

Invited Speech 72

Study on the Mechanical Properties of Glued Laminated Timber Members and Performance of Beam-Column Connections

Speaker **Do Tien Thinh**

Section *9 (Time: 16:50 – 17:00, August 07, 2025)*

Abstract This study presents mechanical properties of glued laminated timber members and performance of beam-column connections using Japanese cedar. As structural connections play a critical role in determining the overall stability and load transfer efficiency of timber frameworks, particular emphasis was placed on assessing both shear and tensile behaviors of connection systems. Full-scale tests were carried out to evaluate the load-bearing capacities of the connections under controlled laboratory conditions. The measured shear and tensile strengths were then compared to the nominal values provided by the manufacturer to verify compliance with design expectations. Results indicated that both connection types exhibited mechanical properties exceeding the prescribed limits, thereby confirming their structural reliability. These findings contribute to the body of knowledge supporting the application of engineered timber in modern construction and demonstrate the viability of GLT systems for safe and efficient structural use in building environments, particularly in regions considering broader adoption of sustainable timber technologies.

Section 10: Prediction method in engineering structures

Plenary lecture 3

Artificial Intelligence Innovations in Structural Health Monitoring

Speaker **Samir Khatir**

Section *10 (Time: 08:00–08:30, August 08, 2025)*

Abstract The deterioration of structural engineering poses a significant economic and societal challenge, highlighting the urgent need for advanced and efficient monitoring methods. In recent years, artificial intelligence (AI) has emerged as a transformative tool in structural health monitoring (SHM), offering substantial improvements in accuracy, robustness, and operational efficiency. Initial AI applications primarily centered on vibration-based monitoring, enabling automated, data-driven damage detection. As AI technologies have evolved, their capabilities have expanded to encompass large-scale data analysis, thereby strengthening predictive maintenance approaches. A notable trend is the growing integration of AI with vision-based techniques, which has further enhanced damage detection capabilities and accelerated the digital transformation of infrastructure monitoring. AI has also played a key role in enabling precise structural displacement tracking and load assessment. This review critically explores the development of AI in SHM, tracing its evolution from early vibration-based methods to the current use of advanced vision-based approaches, with a focus on damage identification, friction, and wear.

Invited Speech 73

Monitoring Column and Shear Wall Shortening in High-Rise Buildings

Speaker **Giang Van Khiem**

Section *10 (Time: 08:30–08:40, August 08, 2025)*

Abstract This study examines the vertical shortening behavior of reinforced concrete columns and shear walls in a 55-story high-rise building. Field measurements were carried out during construction using embedded sensors to monitor time-dependent deformations caused by creep, shrinkage, and elastic shortening. Shortening data were collected at multiple levels, specifically the 16th, 39th, and 49th floors, using embedded sensors installed in both columns and shear walls. Results show that vertical shortening is more pronounced at lower levels due to accumulated loads and

sustained deformation over time. Columns exhibited slightly greater shortening than shear walls at corresponding locations, highlighting the influence of axial flexibility differences between structural elements. Symmetrical sensor pairs demonstrate consistent behavior, validating the structural design's uniformity. One notable exception was an abnormally large shortening at a shear wall location, suggesting localized effects that warrant further investigation. The findings emphasize the importance of differential shortening assessment to minimize long-term deformation-related issues, such as slab distortion and joint misalignment, in tall building construction.

Invited Speech 74

Damage Classification of Steel Frames Using Long Short-Term Memory and Fully Convolutional Network Models

Speaker **Truong Thanh Chung**

Section *10 (Time: 08:40– 08:50, August 08, 2025)*

Abstract In the field of structural health monitoring (SHM), the application of deep learning models for analyzing time-series data has garnered significant attention. One-dimensional convolutional neural networks (1DCNN) are commonly used but face limitations in effectively handling long datasets. Therefore, this study proposes a novel approach by combining 1DCNN with the Squeeze-and-Excitation (SE) mechanism (SE-1DCNN) and Long Short-Term Memory (LSTM) networks to accurately classify structural damage. This combination leverages the spatial feature extraction and attention mechanism of SE-1DCNN alongside LSTM's capability to process long-term time-series data. The model is trained and evaluated using an experimental dataset collected from a steel frame structure instrumented with multiple accelerometers under various damage scenarios. The proposed SE-1DCNN-LSTM model achieves an accuracy of 96.7% on the training set and 95.3% on the test set, outperforming the traditional 1DCNN-LSTM model. These results confirm that integrating SE-1DCNN and LSTM enhances damage classification accuracy and demonstrates strong potential for real-world SHM applications.

Invited Speech 75 **Application of Artificial Intelligence for Detecting Worker Safety Harness Usage During Work at Height to Enhance Safety Risk Management**

Speaker **Tran Le Anh**

Section *10 (Time: 08:50– 09:00, August 08, 2025)*

Abstract Ensuring safety for workers is an important challenge in the industrial environment. This study introduced a computer-based approach to improve safety management and reduce workplace accidents on construction sites. The proposed system utilized the YOLOv11 algorithm to detect hazardous workers, particularly during steel structure installation at heights. The AI-based detector focuses on monitoring safety harness compliance, ensuring that workers adhere to safety regulations. The model was trained on a dataset of construction workers wearing safety harnesses, incorporating images from Vietnamese sites to capture variations in harness styles, shapes, colors, and working postures. The dataset was divided into 67% for training, 24% for validation, and 9% for testing, with YOLOv11 used for object detection. Experimental results demonstrate the system's effectiveness in identifying dangerous positions, automatically detecting whether workers are wearing safety harnesses, reducing response time, and fostering a proactive safety culture. This study highlights the potential of real-time monitoring as a transformative tool for improving worker safety, ensuring compliance with safety standards, and enhancing safety risk management.

Section 10-1: Prediction method in engineering structures

Important Speech 8 **RTK and PPK method in automatic monitoring**

Speaker **Vu Ngoc Quang**

Section *10-1 (Time: 09:15– 09:30, August 08, 2025)*

Abstract This paper investigates and evaluates the effectiveness of an automatic monitoring solution based on the GNSS-RTK method, in comparison with GNSS-PPK, for structural monitoring applications. The study employs two Comnav GNSS-N3 receivers, multi-frequency, multi-channel devices, operating autonomously on the professional CDMonitor platform. Results show that, at short distances, the accuracy of the RTK solution is comparable to that of the PPK approach. These findings serve as a foundation for selecting a suitable monitoring method for structures where the distance between the base station and the antenna mounted on the structure is a critical factor.

Invited Speech 76

Assessing the attributes influencing construction project performance from the perspective of different stakeholders

Speaker **Van Luy Tong**

Section *10-1 (Time: 09:30– 09:40, August 08, 2025)*

Abstract The objective of this study is to evaluate which attributes, as viewed by investors, project managers, contractors, and consultants mostly influence the construction project's performance. Based on the survey results, the study calculated the mean value to assess the importance of each attribute and ranked them based on the views of each interviewee. The results show six attributes with clear stakeholder consensus: Disputes between the parties in construction project (PA22); Quality of equipment and materials (PA24); Quality of construction design (PA25); Planning for construction projects (PO19), Plan to cooperate with suppliers (PA26) and Ability to absorb knowledge (PE12). In terms of theory, this study fills a void by synthesizing the multiple stakeholder perspective in a structured evaluation of construction project performance build on. In practice, they provide project managers, policymakers and industry practitioners with recommendations and ways of alleviating the tackling of dispute resolution process and supplier collaboration, as well as promoting knowledge sharing mechanisms. Research is needed to elucidate relationships of these attributes and investigate their micro and macro long-term effects on sustainable construction project management.

Invited Speech 77

Microgrid Energy Management with the Sand Cat Swarm Optimization

Speaker **Van Nam Nguyen**

Section *10-1 (Time: 10:00– 10:10, August 08, 2025)*

Abstract Microgrid optimization is essential for enhancing economic efficiency, ensuring reliable operation, and integrating renewable energy sources (RESs) into the power grid. However, the variability of renewable generation, fluctuating demand, and dynamic environmental conditions pose significant challenges to conventional optimization methods. This paper proposes an innovative energy management strategy based on the sand cat swarm optimization (SCSO) algorithm. Inspired by the adaptive hunting behavior of sand cats in harsh desert environments, SCSO offers strong robustness in addressing the complex, multi-dimensional, and nonlinear

nature of microgrid optimization. The proposed strategy optimizes power allocation among photovoltaic systems (PVs), wind power plants (WPs), and combined heat and power plants (CHPs) to meet hourly demand while accommodating intermittent generation. Simulations on the IEEE 37-node system confirm the algorithm's superior performance, with notable improvements in energy cost reduction, emission minimization, and renewable energy utilization, outperforming several benchmark optimization methods.

Invited Speech 78

Hybrid Machine Learning for Accurate Prediction of CFST Column Compressive Strength

Speaker **Tran Trung Nguyen**

Section *10-1 (Time: 10:10– 10:20, August 08, 2025)*

Abstract This paper introduces a hybrid machine-learning framework to improve the predictive accuracy of ultimate compressive strength in circular concrete-filled steel tube (CFST) columns. The suggested methodology combines CatBoost with Bayesian optimization to enhance model efficacy and computational efficiency. A dataset of 663 experimental specimens is employed for training and validation. Sophisticated data preprocessing methods, encompassing mathematical transformations, are utilized to enhance feature representation. The efficacy of the proposed method is assessed through a comparative analysis with conventional artificial neural networks (ANN). The hybrid CatBoost model demonstrates enhanced predictive accuracy, significantly lowering error metrics compared to ANN-based models. The proposed framework specifically decreases the Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and R2 score by 146.55, 262.55, and 0.99%, respectively, illustrating its efficacy in structural engineering applications. The selection of CatBoost is driven by its capacity to manage intricate nonlinear relationships, reduce overfitting, and ensure computational efficiency, rendering it a persuasive alternative to traditional machine learning methods.

Invited Speech 79

Numerical analysis of plant-root-reinforced slope in Go Cong, Tien Giang, Vietnam

Speaker **Nguyen Quoc Hung**

Section *10-1 (Time: 10:20– 10:30, August 08, 2025)*

Abstract This manuscript presents a numerical model to evaluate the stability of slopes located along the bank (Go Cong)

with four different plant species, namely Eucalyptus, Stipa, Artemisia, and Rosmarinus. The analyses were performed using shear strength reduction method combined with finite element method implemented in the commercial Plaxis 2D software. In those analyses, plant-induced additional cohesion, which was a function of root depth and root tensile strength, was initially calculated and subsequently added into the original cohesion of bare soil. The Factor of Safety (FoS) was then calculated to examine the effectiveness of the plant species in improving the slope stability, in various scenarios of slope height and angle. Besides, parametric studies were conducted to investigate the increment of FoS due to vegetation reinforcement for several cases of internal friction angle and cohesion of bare soil.

Invited Speech 80

Do Social Constructs and Big-5 Personality Traits Affect The Metro Use? An Application of CART in Decision Tree Model

Speaker **Nghia Pham**

Section *10-1 (Time: 10:30– 10:40, August 08, 2025)*

Abstract The development of Metro systems induces significant changes in the daily habits and lifestyles of residents in affected areas. A thorough understanding of the characteristics of different population groups, including their personality traits, perceptions, and behaviors, plays a crucial role in transportation and infrastructure planning and investment decision-making. This is particularly important in the context of Transit-Oriented Development (TOD), which is being studied and implemented in countries developing Metro systems. This study focuses on exploring the demographic characteristics, and personality traits of 300 residents living in Ho Chi Minh City, Vietnam, to analyze the relationship between these factors and their intention to use the Metro. The Classification and Regression Tree (CART) analysis method, within the decision tree modeling framework, is applied to provide valuable insights for transportation planning that align with the personality traits and perceptions of residents. Emphasizing the psychological well-being of residents is a critical step in enhancing social sustainability and equity, particularly in ensuring accessibility and usability of transportation services.

Invited Speech 81

An Assessment of Critical Success Factors for Mitigating Cost Overruns in Public Infrastructure Construction

Speaker **Minh Nhut Tran**

Section *10-1 (Time: 10:40– 10:50, August 08, 2025)*

Abstract In the dynamic and high-stakes realm of the public sector, cost overruns not only disrupt budgets but also hinder project completion. This study aims to identify the critical success factors (CSFs) essential for minimizing such overruns, which are vital for ensuring financial and operational efficiency. Based on a comprehensive analysis of thirty-nine influential factors derived from expert feedback and relevant documentation, the research employed exploratory factor analysis to distil these into five core success factors. Among them, the availability of high-quality databases and resources emerged as pivotal in mitigating excessive costs and enhancing budgetary efficiency. These findings offer a strategic framework for project managers and policymakers, providing actionable insights to optimize cost control and ensure the successful delivery of public sector projects.

Invited Speech 82

Prediction of Concrete Compressive Strength Using Boosting-Based Machine Learning Algorithms

Speaker **Truong-Giang Nguyen**

Section *10-1 (Time: 10:40– 10:50, August 08, 2025)*

Abstract This study investigates the use of boosting-based machine learning algorithms to predict the compressive strength of concrete, aiming to improve structural safety, optimize mix proportions, and enhance construction efficiency. Traditional empirical models often fall short in modeling the complex nonlinear relationships among input materials. Five popular boosting methods—AdaBoost, Gradient Boosting Machine (GBM), XGBoost, LightGBM, and CatBoost—were evaluated using a benchmark dataset of 1,030 samples from the UCI repository, containing eight numerical features. Model performance was measured using the coefficient of determination (R^2). Among the methods, CatBoost outperformed others with $R^2 = 0.9943$ on the training set and 0.9440 on the testing set, followed by XGBoost and GBM. AdaBoost showed the weakest performance. The results highlight the strong capability of advanced gradient boosting algorithms, particularly CatBoost, in modeling the nonlinear behavior of concrete materials.

Invited Speech 83	**Boosting-based machine learning algorithms for predicting liquefied soil settlement**
Speaker	**Van Than Tran (online)**
Section	*10-1 (Time: 10:50– 11:00, August 08, 2025)*
Abstract	Soil liquefaction-induced settlement is a critical issue in geotechnical engineering due to its potential to cause severe structural damage. Traditional prediction methods often lack accuracy and adaptability when handling complex, nonlinear relationships in soil behavior. In this study, we explore the effectiveness of five boosting-based machine learning models—AdaBoost, Gradient Boosting Machine (GBM), XGBoost, LightGBM, and CatBoost—for predicting post-liquefaction settlement based on geotechnical input parameters. A real-world dataset containing key soil properties and corresponding settlement measurements was used for training and evaluation. The performance of the models was assessed using multiple metrics, including Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and the coefficient of determination (R^2). Among the models, CatBoost demonstrated the highest prediction accuracy with an R^2 score of 0.9705 on the testing set, outperforming both traditional regression techniques and other ensemble models. The findings confirm the potential of boosting algorithms, particularly CatBoost, in accurately modeling complex soil behavior, offering a valuable tool for engineers in liquefaction risk assessment and mitigation planning.

Section 5-1: Advances in Architectural Design

Important Speech 9	**The Influence Of Foreign Design In Contemporary Vietnamese Architecture**
Speaker	**Dang Hoang Vu**
Section	*5-1 (Time: 08:15–08:30, August 08, 2025)*
Abstract	As a result of Vietnam's colonial history, subsidy period, and subsequent economic reforms, contemporary Vietnamese architecture (from 1986 to the present) has had a reliance on Western design. The perception of French colonial-style buildings representing "opulence" has led to its heightened use in shaping urban landscapes. This article analysis the impact of Vietnam's history on contemporary architecture, evaluating the positive and negative uses of the European "revival" architecture for Vietnamese landscapes and audiences. The article

demonstrates that these architecture trends have been an inevitable phenomenon, following other revival trends across history, and discusses the future for modern Vietnamese architecture in the context of globalisation and a focus on sustainability for up-and-coming architects. It is, therefore, concluded that Vietnamese architecture is on a path to create new designs that incorporate Western influences with a stamp of local traditions, cultures, and climate needs.

Invited Speech 84 **Typologies of agro-industrial parks suitable for Vietnam**

Speaker **Tran Quang Huy**

Section *5-1 (Time: 08:30– 08:40, August 08, 2025)*

Abstract Agro-Industrial Parks (AIPs) are advanced centralized production models successfully implemented in many countries, adapted to local conditions. In Vietnam, early AIP-like models such as agricultural-focused industrial parks and high-tech agricultural parks exist but face legal and research limitations. The Vietnamese government is undergoing major administrative and planning reforms, focusing on national, regional, provincial, and sectoral planning. Given that agriculture still employs the majority of the workforce, research on suitable models for concentrated production areas is essential. Drawing on global experience, the research team proposes tasks and functional components to help identify AIP types suited to Vietnam's production conditions.

Invited Speech 85 **Smart Parks- Challenges and Development opportunities in Vietnam**

Speaker **Huong Thi Dieu Nguyen**

Section 5-1 (Time: 08:40– 08:50, August 08, 2025)

Abstract In the context of the Industrial Revolution 4.0 and the digital transformation trend, technological advances are affecting every aspect of life. Cities are becoming "smarter", using technology to improve the ability to live, work, entertain, and increase sustainability. Smart parks are also one of the trends of the times. They not only utilize advanced technology to effectively manage resources and improve the ecological and social environment of the city, but also enhance community connectivity by placing people at the center and providing better, smarter services. Learning from international experience in applying

technology to solve challenges in park management and operation, as well as recommending the development of smart park development with new approaches suitable for conditions in Vietnam is the content that the article wants to mention.

Section 11: Underground engineering

Important Speech 10

Study the Behavior of Flexible Pipes Considering the Dilatancy Effect of Sand

Speaker **Giang Vu-Thi-Thuy**

Section *11 (Time: 09:15– 09:30, August 08, 2025)*

Abstract The mechanical behavior of flexible pipes buried in sandy soils is significantly influenced by the dilatancy of sand—a critical factor in pipe–soil interaction that governs load transfer mechanisms and soil deformation behavior. This study investigates the role of dilatancy in soil behavior and pipe deformation under. This paper examines the behavior of backfill material, specifically sand, in both elastic and plastic states, and explores how dilation influences pipe load and deformation. A computational analysis integrating traditional methods, such as Iowa's equation, with stress-dilatancy theory and critical state soil mechanics is presented. The results highlight the importance of accounting for dilatancy in design models and suggest future research directions in pipeline–soil interaction.

Invited Speech 86

Settlement Prediction of Nodular Piles: A Machine Learning Perspective

Speaker **Nguyen Tan**

Section *11 (Time: 09:30– 09:40, August 08, 2025)*

Abstract Predicting the settlement of nodular piles under static loading is challenging due to the nonlinear nature of pile–soil interaction. In this study, we use a hybrid model that combines Artificial Neural Networks (ANNs) with the Covariance Matrix Adaptation Evolution Strategy (CMA-ES) to tune hyperparameters and network architecture automatically. The model is trained using experimental data that include pile geometry, applied load, and soil conditions. To interpret the model, we apply feature importance method. The results show that the ANN–CMA-ES model produces accurate predictions and identifies the most important input variables, such as load and cylindrical diameter. This modelling approach may help improve decision-making in pile foundation design.

Invited Speech 87

Properties of CDM Columns from Unconfined Compression Test: A case study in Ho Chi Minh City

Speaker **Nguyen Khac Tan Da**

Section *11 (Time: 09:40– 09:50, August 08, 2025)*

Abstract In recent years, cement deep mixing (CDM) columns have been widely adopted as a ground improvement solution for enhancing the stability of excavation bases in the basement construction of high-rise buildings on soft soils in Ho Chi Minh City. This technique plays a vital role in improving the mechanical characteristics of soft soils, including unit weight, shear strength, and elastic modulus. A total of 580 CDM samples were collected by core drilling from 65 in-situ CDM columns. Un-confined compression tests were carried out to determine the unconfined compressive strength q_u, elastic modulus E50, and unit weight γCDM of the CDM columns. The study aims to assess the critical engineering properties of CDM columns, with emphasis on q_u and E50, in the context of deep excavation for basement construction. This study investigates the correlation between the unit weight of natural soil and that of CDM columns, evaluates the $E50/q_u$ ratio. The findings of this study provide a practical framework for engineers to assess potential risks and enhance the reliability of design and construction practices for multi-basement structures with excavation bases reinforced by CDM columns.

Invited Speech 88

A Comprehensive Review of Load Distribution in Piled Raft Foundations: Effects of Pile Number and Spacing on Pile Raft Interaction

Speaker **Vo Van Dau**

Section *11 (Time: 09:50 – 10:00, August 08, 2025)*

Abstract This study provides a comprehensive review of load distribution behavior in piled raft foundations, with emphasis on the effects of pile number (n) and pile spacing (S) on the interaction between the raft and pile system. Results from analytical models, numerical simulations, and physical model experiments are synthesized to assess how these geometric parameters influence the proportion of vertical load carried by the raft and the piles. A consistent trend is observed: increasing the number of piles leads to a decrease in the load share carried by the raft (Pr/Pt) and a corresponding increase in the load carried by the piles (Pc/Pt). This indicates that, as pile density increases, the pile system gradually assumes a

dominant role in supporting vertical loads. Conversely, increasing the pile spacing from 2.5D to 5D results in a higher raft load share for the same number of piles. This trend is more pronounced in configurations with fewer piles, where reduced interaction between widely spaced piles requires the raft to absorb a greater portion of the load. Comparative results also reveal that modern approaches, particularly physical modelling, finite element modelling (FEM), and advanced analytical methods, exhibit higher sensitivity to geometric variations and better capture the nonlinear nature of pile - raft interaction than simplified linear models. The convergence of results across different methods demonstrates the reliability of these approaches and their potential for improving foundation design practices. This review highlights the need to incorporate interaction effects into design guidelines to ensure accurate modelling of load sharing in piled raft systems.

Invited Speech 89

Investigating natural frequencies of sand Soil Foundations for predicting landslide Based on Field Tests

Speaker **Quynh Le Bao**

Section *11 (Time: 10:00– 10:10, August 08, 2025)*

Abstract To predicting the landslide ability of sandy soil around the riverbank area, a field test for the vibration propagation of the ground surface at different positions from a fixed vibration excitation was performed near the river. While the current standards for ground vibration focus on predicting the vibration amplitude, this paper studies the frequency content. By analyzing the vibration response in all three directions under impact loads that are susceptible to resonance, the natural frequencies were extracted to evaluate the characteristics of the ground. Then, a novel indication for landslide is presented based on the appearance of natural frequencies in each vibration direction. The effectiveness and suitability of this evidence based on the transmission capacity and matched vibration model. It is showed that the vibration response of the ground weakens not only with a decrease in frequency when stiffness of soil reduces but also with an increase in the number of frequencies when soil layers lose cohesion. This study provides reference for disaster prevention agencies and for construction planning along river areas.

Invited Speech 90

Displacement analysis of CDM retaining walls with CDM bottom-enhanced stability in soft ground excavation in Ho Chi Minh City

Speaker **Thanh Nhan Pham**

Section 11 (Time: 10:10 – 10:20, August 08, 2025)

Abstract The use of Cement Deep Mixing (CDM) columns has become increasingly common in the construction of deep excavations in soft soil conditions. CDM columns are employed both to improve the ground within the excavation area and to serve as retaining walls in construction projects involving one or more basement levels. The horizontal displacement of CDM walls serves as an important indicator of the stability of the excavation and the safety of adjacent structures. This study investigates the horizontal displacement behavior of CDM walls by varying the CDM replacement ratio in the improved zone. The analysis is conducted through a comparison between numerical results obtained using the finite element method and field data from 32 monitoring points. Based on this comparison, the study evaluates the influence of CDM replacement ratio on the displacement pattern of CDM walls in deep excavation projects.

Invited Speech 91

TPE-Optimized Neural Network Framework for Predicting Settlement of Nodular Pile Foundations

Speaker **Nguyen Tan**

Section *11 (Time: 10:20– 10:30, August 08, 2025)*

Abstract This study presents a data-driven approach to predicting settlement of statically loaded pile foundations. We employ an Artificial Neural Network (ANN) model whose hyperparameters are fine-tuned using the Tree-Structured Parzen Estimation (TPE) method. The training procedure uses data obtained from physical tests, incorporating key factors such as nodular pile size, vertical loading conditions, and soil resistance characteristics. The results demonstrate that the optimized ANN model provides robust predictive performance. This approach offers valuable potential to improve the reliability of geotechnical design practices.

Invited Speech 92	**An undrained cyclic behavior of reinforced liquified stabilized soil cured outdoor**
Speaker	**Hung Khac Le**
Section	11 (Time: 10:30– 10:40, August 08, 2025)
Abstract	Liquefied Stabilized Soil (LSS), a cement-stabilized soil pre-mixed in Japan, is a common application for excavated soil. This study examined the LSS behavior under cyclic loading using Consolidated-Undrained triaxial cyclic testing with cyclic deviator stress of amplitude variation on 10 kg/m3 fiber content cured 28 days outdoor. Following test results, both indoor and outdoor curing do not cause liquefaction. The existence of a critical stress level in cases of outdoor curing between 0.6 and 0.72 of stress ratio SR, which is higher compared to indoor curing. The results also conclude that at low cycle stress levels, LSS cured outdoor exhibits improved elasticity, while at high stress levels, strain softening increases. This is due to outdoor cement-hydration. In addition, LSS cured outdoor under high cyclic stress has higher stiffness degradation, strain energy dissipation, and inelasticity accumulation than indoor LSS.

Section 4-1: Advances in Construction Management

Important Speech 11	**Factors affecting construction cost contingencies: An integrated analysis of key factors in construction projects**
Speaker	**Vo Dang Khoa**
Section	*4-1 (Time: 08:15–08:30, August 08, 2025)*
Abstract	Delays and cost overruns are major challenges in construction projects worldwide, especially in rapidly urbanizing cities such as Ho Chi Minh City, Vietnam. Special pressures such as resource constraints and large infrastructure needs contribute to this inefficiency. Research on the factors that impact delays and cost overruns is needed, especially in the local environment. This study identifies and analyzes the main factors that contribute to construction inefficiency in Ho Chi Minh City. A literature review was conducted to identify important factors. A survey was conducted using a 5-point Likert scale with 109 experts, including contractors, owners, and consultants. Data analysis included descriptive statistics, Relative Importance Index (RII) to rank factors, and Exploratory Factor Analysis (EFA) to group-related variables. The five key factors are Finance and Cash Flow, Financial Capacity and Payment Delays, Construction Defects, Legal Factors, and Planning and Scheduling. In addition, the EFA results indicate four components:

Contractor and Financial Management, Procurement and Equipment Management, Planning and Decision Making, and External and Stakeholder Management. The priorities for the factors are inconsistent between the owner and the consultant, highlighting the need for closer collaboration. The study emphasizes addressing financial challenges, improving contractor capacity, and promoting stakeholder communication to improve project efficiency and sustainability. The study provides insights that can build an actionable framework to address construction inefficiencies in urbanized areas.

Invited Speech 93 **Critical factors affecting the project management processes of construction projects in Vietnam from different viewpoints of stakeholders**

Speaker **Dung Thuy Dinh**

Section *4-1 (Time: 08:30– 08:40, August 08, 2025)*

Abstract This paper presents results of identifying critical factors affecting process groups of the project management processes of construction projects in Vietnam. The study collected data from individuals working on construction projects in Hanoi. This study ranked factors using the Relative Influential Index (RINI) from different viewpoints of stakeholders. The study found that two leading critical factors are associated with the initial stage and three with the controlling stage from an overall viewpoint. This information implies that stakeholders of construction projects in Vietnam are often concerned about the initial and controlling phases. Moreover, the least influential factors are associated with the planning stage. This is very intriguing. These findings may be used as a guideline to develop appropriate strategies so that project stakeholders of construction projects in Vietnam improve the efficiency of project management processes.

Invited Speech 94 **Social-Demographic and Transportation Habit Effects on Residents' Intention to Use Metro**

Speaker **Nghia Pham**

Section *4-1 (Time: 08:40– 08:50, August 08, 2025)*

Abstract Considered a solution to address traffic congestion and air pollution caused by private vehicles, Metro systems have become widespread across the world and serve as a popular means of transportation in several countries. The influence area around stations also shape and create "compact areas" called "Transit-Oriented Development

ares". TOD is a strategic plan aimed at promoting growth through the use of metro systems and integrated public transportation as a replacement for personal vehicles. To identify the factors influencing the use of the Metro system by residents in Ho Chi Minh City, Vietnam. This study analyzes demographic characteristics and transportation usage habits, while also assessing whether these two factors impact the decision to use the Metro system. The analytical method employed in this study is the CART decision tree (Classification and Regression Tree), using analysis data collected through questionnaires from 300 residents living around station areas in Ho Chi Minh City. The results of this study show that bus usage habits and distance to the Metro station have a strong impact on the intention to use the Metro, while factors such as educational background, age, and income have less influence.

Invited Speech 93

Analyzing Motivators for Facilitating Circular Economy Implementation in Vietnamese Construction Enterprises

Speaker **Minh Huy Nguyen**

Section *4-1 (Time: 08:50– 09:00, August 08, 2025)*

Abstract In order to meet the demand for sustainable development in Vietnam's construction industry, promoting the circular economy (CE) model is increasingly being recognized as a means to optimize resource use and minimize negative environmental impacts. This study focuses on identifying the key factors that motivate construction enterprises in Vietnam to adopt CE principles. Through a survey conducted with experts in the construction and supply chain management sectors, data was collected to analyze and rank the influence of each factor. Utilizing exploratory factor analysis with SPSS software, the study assessed the primary driving factors for CE implementation in the construction industry. These findings will help enterprises develop strategic approaches to leverage CE principles and foster sustainable development in the future.

Section 12: Dynamic and Stability Analysis of Structures

Important Speech 12

Load-Bearing Capacity of Reinforced Concrete Beams with Corroded Longitudinal Rebars

Speaker **Duy Nguyen Phan**

Section *12 (Time: 09:15– 09:30, August 08, 2025)*

Abstract Corrosion-induced deterioration of reinforced concrete (RC) structures poses a significant challenge worldwide. Studies aimed at accurately predicting the flexural performance of corroded RC beams are essential for assessing the limit state of structural elements. This study proposes predictive models for the load-bearing capacity of corroded slender RC beams using data from 145 beams tested in previous investigations. The database was analyzed using an artificial neural network (ANN) and an improved beam section model to identify critical parameters and develop a semi-empirical formula. The results indicate that the ANN model can effectively predict the ultimate flexural strength of beams with corroded longitudinal reinforcement, achieving an R-squared value of 0.9882. Parameter importance analysis enabled the development of a semi-empirical formula that can be conveniently applied by engineers. The beam section analysis-based formula also provides highly accurate predictions of load-bearing capacity, with an R-squared value of 0.9688. A comparison with previous formulas shows that the proposed models yield superior results.

Invited Speech 94

Influence of earthquake frequency content on soil liquefaction

Speaker **Nguyen Van Quang**

Section *12 (Time: 09:30– 09:40, August 08, 2025)*

Abstract This study aims to identify earthquake intensity measures (IMs) that have a reasonable correlation with pore water pressure (PWP). Moreover, the effect of earthquake frequency contents on site response is also investigated. To this end, the centrifuge model test (RPI2) soil profile used in the LEAP-2017 project and twenty input ground motions are employed to conduct effective stress analyses utilizing the one-dimensional (1D) site response analysis (SRA) program. The stress-based simulation model is first validated with centrifuge test results. Afterwards, two sets of analyses are carried out: (1) the analyses with twenty recorded motions to determine the optimal IM for PWP, (2) the analysis with scaled motion to examine the effect of earthquake frequency content. The numerical results show

that peak ground acceleration (PGA), characteristic intensity (Ic), acceleration that accounts for up to 95% of the arias intensity (A95), root-mean-square of acceleration (Arms), and sustained maximum velocity (SMV) are the IMs that yield the most advantageous and accurate predictions for PWP. In contrast, PWP exhibits a weak correlation with the predominant period (Tp), mean period (Tm), PGVmax/PGAmax, and maximum displacement. In comparison to low-frequency (LF) ground motions, high-frequency (HF) ground motions tend to generate more significant site responses and lead to increased pore water pressure (PWP) in near-surface soil layers. HF motions lead to higher levels of spectral acceleration at the short-period and lower levels at the long-period.

Invited Speech 95 **Navier-based approach for static and vibration analysis of FGP-core sandwich plates with FG-CNTRC cross-ply laminated face sheets**

Speaker **Hoang Nam Nguyen**

Section *12 (Time: 09:40– 09:50, August 08, 2025)*

Abstract This paper examines the bending and free vibration behavior of a rectangular sandwich plate based on Reddy's third-order shear deformation theory (RTSDT). The plate features a functionally graded porous material (FGP) core and cross-ply carbon nanotube-reinforced (CNT) face sheets. By applying the Navier solution, the governing equations are derived to determine the natural frequency and deflection of the simply supported sandwich plate. Systematic verification confirms the accuracy and reliability of the proposed model. Numerical studies reveal the influence of the porosity index of the FGP core, CNT distribution patterns, and the number of CNT layers on the plate's deflection and fundamental frequency.

Invited Speech 96 **Steel slag as a sustainable substitute in concrete**

Speaker **Nguyen Van Nam**

Section *12 (Time: 10:00– 10:10, August 08, 2025)*

Abstract This study investigates the feasibility of using steel slag (SS) as a sustainable alternative in concrete by partially replacing cement, coarse, and fine aggregates. Three concrete mixes were designed: M1 (control), M2 (SS as coarse aggregate), and M3 (SS powder and fly ash

replacing cement). Workability tests showed SS aggregates reduced slump retention due to their porous structure, while FA in M3 improved it. SS accelerated cement setting, with M2 setting faster than M1, while M3 had a slightly delayed setting due to FA. Strength tests revealed similar compressive strengths among all mixes at 90 days, with M2 enhancing flexural strength by 12.7%. SEM analysis confirmed improved microstructure in M3, with a dense C-S-H gel network reducing voids and cracks. These findings highlight SS's potential as a viable replacement material in sustainable concrete production.

Invited Speech 97 **Limit State of Elastic Strip under Combined Loading**

Speaker **Pham Ngoc Vuong**

Section *12 (Time: 10:10– 10:20, August 08, 2025)*

Abstract This paper investigates the limit state of an elastic strip composed of a heterogeneous material with uneven side surfaces. Compressive forces are considered independently along the upper and lower boundaries as well as the lateral edges of the strip's cross-section. A criterion based on the continuous dependence of the system's response on initial data is proposed as a necessary condition for identifying the disruption of normal functioning. A violation of this continuity can lead to two types of limit states: the first involving a loss of stability, and the second characterized by excessive deformations and potential system failure. In the mathematical model, boundary conditions in the deformed configuration are incorporated, and the influence of rotation angles in the equilibrium equations is taken into account following the approaches of Novozhilov and Ishlinsky. A condition is derived that identifies the boundary region where the strip reaches a limit state, corresponding to the loss of stability of its equilibrium form. The impact of nonlinearity in the equilibrium equations within this critical region is also analyzed. The reliability of the results is supported by their agreement with established findings in the literature. Additionally, for various cross-sectional parameter values, regions are constructed where the stress-strain state remains approximately uniform.

Invited Speech 99

The Impact of Periodic Tidal Variations on the Stability of Riverbanks

Speaker **Nhut-Nhut Nguyen**

Section *12 (Time: 10:30– 10:40, August 08, 2025)*

Abstract There are many causes leading to riverbank instability and erosion, such as excessive sand exploitation, ship waves, water flow, tidal level, floods, soft ground, human construction activities, etc. In Ho Chi Minh City, where the river system is quite developed and is greatly affected by high tide flooding, the riverbank geology is also strongly affected by tidal fluctuations. The study thus focuses on analyzing the influence of periodic tidal variations on the stability of riverbank slopes. PLAXIS 2D is applied to model riverbank cross- sections with different slopes, from 16o to 55o, under the influence of tidal levels which change over time to assess their influence on displacement, hydraulic gradient and stability coefficient. Consequently, warnings are given about slopes with high risk of erosion. These slopes are compared with observed erosion slopes to check the reliability of modeling. The findings contribute to improving erosion prediction methods by demonstrating how repeated tidal fluctuations can induce progressive weakening of the riverbank structure. These insights have practical implications for the design of riverbank protection systems in estuarine and coastal river environments where tidal actions are prominent.

Invited Speech 100

Reliable and Interpretable AI for CFST Column Safety Assessment

Speaker **Tran Trung Nguyen**

Section *12 (Time: 10:40– 10:50, August 08, 2025)*

Abstract This work suggests a hybrid framework to predict the dependability of concrete-filled steel tube (CFST) columns under axial stress by combining Monte Carlo Simulation (MCS), the Catboost gradient boosting technique, and SHAP explainability. The model was trained using a dataset of 663 experimental CFST samples; the regression target was the computed failure probability Pf using Monte Carlo Simulation (MCS). Based on the dependability metric β, the CatBoost model effectively classified all samples into safety categories and achieved high predicted accuracy. According to SHAP analysis, geometric parameters—especially outer diameter, wall thickness, and column length—had the highest impact on expected failure probability. The dataset often revealed that a significant fraction fell below the accepted safety

threshold, which emphasizes the importance of design review in many respects. Moreover, a decision tree classifier was constructed to extract rule-based safety reasoning, providing a precise tool for informed engineering decisions. The proposed framework offers an accurate, interpretable, and computationally efficient alternative to conventional dependability evaluation techniques, leveraging transfer learning and semi-empirical modeling. It lays a strong basis for future applications to eccentric loading situations.

Invited Speech 101

Static Analysis of Carbon Nanotube Reinforced Solid Plate by Using Isogeometric Analysis

Speaker **Ngo Khanh Binh**

Section 12 (Time: 10:50– 11:00, August 08, 2025)

Abstract This study examines the static behavior of carbon nanotube-reinforced composite solid plates under uniform transverse loading using three-dimensional isogeometric analysis. The implementation of the NURBS shape function helps avoid the shear locking phenomenon. To evaluate the accuracy and convergence of the method, this study examines several mesh densities and different orders of NURBS shape functions. Special attention is given to how the number of elements through the plate's thickness affects the results. The results demonstrate that, similar to those of previous studies, results can be achieved with third-order NURBS functions and only a few elements in the thickness. These results reveal that 3D IGA can be an effective and accurate method for simulating CNTRC structures. Overall, the study provides practical guidance on selecting suitable discretization strategies when analyzing the mechanical behavior of CNT-reinforced plates.

Conference Chair

Assoc. Prof. Le Thanh Cuong
Center for Engineering Application & Technology Solutions
Ho Chi Minh City Open University

Dr. Samir Khatir
Belgium

Conference Co-chair

Assoc. Prof. Vu Thi Bich Quyen
Head of the Department of Material Strength – Structural Mechanics
Hanoi Architectural University

Conference Secretary

Dr. Le Van Binh
The Head of Department of Investment and Construction
Ho Chi Minh City Open University

Dr. Le Minh Hoang
Center for Engineering Application & Technology Solutions
Ho Chi Minh City Open University

Dr. Vu Huu Truong
Vietnam Maritime University

Msc. Tran Minh Luan
Center for Engineering Application & Technology Solutions
Ho Chi Minh City Open University

Msc. Nguyen Khac Quan
Faculty of Civil Engineering
Ho Chi Minh City Open University

Mr. Ton That Tri
Center for Engineering Application & Technology Solutions
Ho Chi Minh City Open University

For more information

Website: shmesconf.ou.edu.vn
Email: conf.shmes@ou.edu.vn
Tel: +84 77 902 1564 (Mr.Tri)
+84 78 884 8265 (Mr. Luan)

Nha Trang Trip

August 08, 2025

Begin
14:00

Long Son
Pagoda

DINNER
Nem nướng Nha Trang

Free

Ponagar
Temple

LOCATION

http://shmesconf.ou.edu.vn/

Yasaka Saigon Nhatrang

18, Tran Phu street, Loc Tho District,
Nha Trang City, Vietnam