



ICCEPM 2022

The 9th International Conference on
Construction Engineering and Project Management

Responding to the New Normal through Research and Innovation

Dates: June 20 (Mon) – 24 (Fri), 2022

Venue: UNLV Student Union, Las Vegas, USA

Organizers: University of Nevada, Las Vegas & Texas A&M University



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ICCEPM 2022 PROGRAM OVERVIEW

The ICCEPM2022 theme is ***“Responding to the New Normal through Research and Innovation.”*** Under this theme, the conference provides inspiring and thought-provoking opportunities through engagement with internationally renowned scholars and industry leaders known for their innovation. The conference programs include three pre-conference workshops, four keynote speeches, more than 160 oral presentations, and three post-conference workshops along with many networking opportunities. We hope you enjoy the conference activities and also you have some time to enjoy attractions and fun things that Las Vegas offers.

Conference Organizing Team

- **Conference Co-Chairs:**



Dr. David Jeong
Construction Science
Texas A&M University



Dr. Jin Ouk Choi
Civil and Environmental Engineering & Construction
University of Nevada, Las Vegas

- **Technical Program Co-Chairs:**



Dr. Youngjib Ham
Construction Science
Texas A&M University



Dr. Jee Woong Park
Civil and Environmental Engineering & Construction
University of Nevada, Las Vegas

- **Technical Committee Members**

- Dr. Ahmed Abdelaty
(University of Wyoming)
- Dr. Ashrant Aryal
(Texas A&M University)
- Dr. Changbum Ryan Ahn
(Seoul National University)
- Dr. Fei Dai
(West Virginia University)
- Dr. Heesung Cha
(Ajou University)
- Dr. Houtan Jebelli
(Penn State University)
- Dr. Hyunsoo Kim
(Dankook University)
- Dr. Ibukun Awolusi
(The University of Texas at San Antonio)
- Dr. Jeehee Lee
(University of Nevada, Las Vegas)
- Dr. Jingdao Chen
(Mississippi State University)
- Dr. Kyubyeung Kang
(Purdue University)
- Dr. Manish Dixit
(Texas A&M University)
- Dr. Neil Opfer
(University of Nevada, Las Vegas)
- Dr. Phil Barutha
(University of Nebraska-Lincoln)
- Dr. Pramen Shrestha
(University of Nevada, Las Vegas)
- Dr. Robert Le
(Clemson University)
- Dr. Soowon Chang
(Purdue University)
- Dr. Taewan Kim
(Incheon National University)
- Dr. Youngcheol Kang
(Yonsei University)
- Dr. Zhen Lei
(University of New Brunswick)
- Dr. Zofia Rybkowski
(Texas A&M University)

- **Best Paper Awards Committee Members**

- Dr. Amir Behzadan
(Texas A&M University)
 - Dr. Bryan Franz
(University of Florida)
 - Dr. Eric Jing Du
(University of Florida)
 - Dr. Pingbo Tang
(Carnegie Mellon University)
 - Dr. Qingbin Cui
(University of Maryland)
 - Dr. Young Hoon Kwak
(George Washington University)
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Conference Sponsors and Supporting Organizations



Autodesk, Inc. is an American multinational software corporation that makes software products and services for the architecture, engineering, construction, and entertainment industries. Autodesk became best known for AutoCAD, but now develops a broad range of software for design, engineering, and entertainment. <https://www.autodesk.com>



HanmiGlobal is a global Project Management company that pursues customer value creation as a top priority while striving for outstanding results. HanmiGlobal continues to enhance technical competencies to solve the world's complex challenges, and also cultivate the core capabilities as a 'Total Solution Provider'. <https://www.hmglobal.com/en/index.asp>



The Korean-American Construction Engineering and Project Management Association (KACEPMA) is a membership association consisting principally of Korean and Korean-American construction industry professionals, college and university professors, and graduate students teaching or studying construction engineering and other construction-related subjects. <https://www.kacepma.org/>



The Associated General Contractors of America (AGC) is a trade association in the United States construction industry, with headquarters in Arlington, Virginia. AGC represents over 6,500 of America's general contractors and over 9,000 specialty-contracting firms. More than 10,500 service providers and suppliers are also associated with AGC, through a nationwide network of chapters. <https://www.agc.org/>



The American Society of Civil Engineers (ASCE) - Construction Institute (CI) is 1 of 9 ASCE Technical Institutes and has over 16,000 members worldwide. CI provides you with the resources to shape the future of the construction industry by participating in technical activities, conferences, and the development of internationally recognized standards. <https://www.asce.org/communities/institutes-and-technical-groups/construction-institute>



The Associated Schools of Construction (ASC) is the professional association of construction educators and industry practitioners working together for the development and advancement of construction education. It promotes the sharing of ideas and knowledge and inspires, guides, and promotes excellence in curricula, teaching, research, and service. <https://www.ascweb.org/#>



The Korea Institute of Construction Engineering and Management (KICEM) is the leading professional membership society of construction engineering and management in Korea. KICEM has held annual conferences and international conferences as well as various seminars and forums since its founding to provide timely information to its members and the general public. <https://www.kicem.or.kr/eng/>

Floor Plan

- UNLV - Student Union, 2nd floor (4505 S. Maryland Pkwy. Las Vegas, NV 89154)



Conference Schedule

Day 1 (June 20, Monday)

Time/Room	Prefunction Space	Ballroom A	Ballroom B	Ballroom C	Room 205
12:00 PM -	Registration				
12:30 PM - 02:15 PM			Pre-Conference Workshop 1 (Lean Construction Simulation)		
02:15 PM - 02:45 PM	Registration & Networking Break (Coffee/Tea)				
02:45 PM - 04:30 PM	Registration	Pre-Conference Workshop 2 (Modularization)	Pre-Conference Workshop 3 (Digital Construction)		
04:30 PM - 07:30 PM				Welcome Reception	
05:00 PM - 07:00 PM					ICCEPM Board Meeting

Day 2 (June 21, Tuesday)

Time/Room	Ballroom
08:00 AM - 07:00 PM	Registration (Prefunction Space)
08:00 AM - 09:00 AM	Breakfast
09:00 AM - 09:30 AM	Opening Ceremony
09:30 AM - 10:00 AM	Keynote Speech 1 - Dr. James O'connor
10:00 AM - 10:30 AM	Keynote Speech 2 - Dr. Tony Dong

Time/Room	Prefunction Space	Room 205	Room 207	Room 209	Room 211	Room 213	Ballroom	
10:30 AM - 11:00 AM	Coffee/Tea	Networking Break						
11:00 AM - 12:15 PM		Session 1 - A	Session 1 - B	Session 1 - C	Session 1 - D	Session 1 - E	Session 1 - F (AGC case study)	
12:15 PM - 01:45 PM		Lunch Break						Lunch
01:45 PM - 03:00 PM		Session 2 - A	Session 2 - B	Session 2 - C	Session 2 - D	Session 2 - E		
03:00 PM - 03:30 PM	Coffee/Tea	Networking Break						
03:30 PM - 05:00 PM		Session 3 - A	Session 3 - B	Session 3 - C	Session 3 - D	Session 3 - E		
05:30 PM - 07:30 PM							KACEPMA Meeting	

Day 3 (June 22, Wednesday)

Time/Room	Ballroom
08:00 AM - 07:00 PM	Registration (Prefunction Space)
08:00 AM - 09:00 AM	Breakfast
09:00 AM - 09:30 AM	Sponsor Spotlight Presentations
09:30 AM - 10:00 AM	Keynote Speech 3 - Dr. Glenn Ballard
10:00 AM - 10:30 AM	Keynote Speech 4 - Dr. Marwan Abu Ebeid

Time/Room	Prefunction Space	Room 205	Room 207	Room 209	Room 211	Room 213	Ballroom
10:30 AM - 11:00 AM	Coffee/Tea	Networking Break					
11:00 AM - 12:15 PM		Session 4 - A	Session 4 - B	Session 4 - C	Session 4 - D	Session 4 - E	Session 4 - F (CM Study abroad)
12:15 PM - 01:45 PM		Lunch Break					Lunch
01:45 PM - 03:00 PM		Session 5 - A	Session 5 - B	Session 5 - C	Session 5 - D	Session 5 - E	
03:00 PM - 3:30 PM	Coffee/Tea	Networking Break					
03:30 PM - 05:00 PM		Session 6 - A	Session 6 - B	Session 6 - C	Session 6 - D	Session 6 - E	
05:30 PM - 07:30 PM							Banquet Dinner

Day 4 (June 23, Thursday)

Time	
08:30 AM - 09:00 AM	Registration
09:00 AM - 11:30 AM	Post-Conference Workshop 1 (Modular Construction)*
11:30 AM - 01:00 PM	Lunch Break

* Thomas T. Beam Engineering Complex-B 365 (4505 Maryland Pkwy, Las Vegas, NV 89154)

Day 5 (June 24, Friday)

Time	
09:00 AM - 11:30 AM	Post-Conference Workshop 2 (Scan-to-BIM)*

* Thomas T. Beam Engineering Complex-B 365 (4505 Maryland Pkwy, Las Vegas, NV 89154)

Keynote Speech

Keynote 1: Some Key Learnings from a Career in Capital Projects-related Research, Teaching, & Consulting



Dr. James O' Connor
Professor, C.T. Wells Professorship in Project Management,
University of Texas at Austin

Some key learnings will be shared from a 38-year career in research, teaching, and consulting related to capital projects. Learnings will cut across multiple industry sectors, project phases, project objectives/drivers/impacts, research methodologies, course topics, and consulting engagements, among others.

Keynote 2: Industry-Academia Collaboration – Lessons Learned, Takeaways, and Insights from Both the Education and Research Perspectives



Dr. Tony Dong
National Lead of Research and Business Process Improvement,
DPR Construction

Industry-academia collaboration – lessons learned, takeaways, and insights from both the education and research perspectives. The speaker will reflect on his four-year-long collaboration with the industry as a Ph.D. student and then a seven-year journey as the liaison between DPR and academia.

Keynote 3: Why I've devoted my life to advancing Lean Construction



Dr. Glenn Ballard
Research Director, Productions Systems Laboratory,
University of California, Berkeley

Now 77 years old, I've devoted the last 40 years to advancing Lean Construction. In my talk, I will try to explain why I've done that and why you should do the same. Here is a taste of what's to come: Why Lean Construction? Because doing construction the Lean way provides more value to customers; a better quality of work-life for designers, builders, and suppliers; and reveals career opportunities for young people.

Keynote 4: Integrating Industry 4.0 Technologies for Construction Management – A proof of concept study



Dr. Marwan Abu Ebeid
Digital Transformation Lead,
Turner Construction International – Middle East

This presentation demonstrates a proof-of-concept for integrating Blockchain and the Internet Of Things into an automated BIM process to monitor and control the information flow. The case study focuses on eliminating human errors and establishing a single automated source of truth to increase transparency and enable enhanced decision-making. To this end, the proof-of-concept introduces a monitoring system that is reliable and fully automated through data gathered by IoT, transacted through Blockchain, and presented through BIM platform.

Pre-Conference Workshops

Pre-Conference Workshop 1: Serious Games for Construction Management



- **Workshop leaders:** Dr. Zofia Rybkowski (TAMU) & Dr. David Jeong (TAMU)
- **Date & Time:** June 20, 2022, 12:30 PM to 2:15 PM
- **Free for Conference Attendees**
- **Description:**

This workshop will be fun and very entertaining. You will laugh a lot and make new friends. Please join us. The session will provide a hands-on experience of serious games to help you develop an intuitive understanding of difficult-to-grasp project management principles. The intention of serious games is to help participants experience an “A-ha” moment about ways to successfully address construction management situations that can then be applied to the real world. In-person games, as well as Virtual Reality (VR) games in a group setting, will be available for workshop participants.

Pre-Conference Workshop 2: The Fine Art of Offsite Preassembly



- **Workshop leaders:** Michael Kluck (KBR) & Dr. Jin Ouk Choi (UNLV)
- **Date & Time:** June 20, 2022, 2:45 PM to 4:30 PM
- **Free for Conference Attendees**
- **Description:**

Modularization is a simple concept – Move what you want to build to a place where it can be built cheaper, better and faster – than move the finished unit back. So, what’s the big deal? Oh, yea – “the devil is in the details”..... In this workshop, we will introduce you to the “details”: How to approach the task, common pitfalls, suggested solutions, and lots of other groundwork needed to become a module “rock star”. All approached from a unique perspective, shown in a different way than you may have seen before.

Pre-Conference Workshop 3: Connecting Construction Workflows in the Cloud



- **Workshop leaders:** Dr. Jeonghan Woo (Cal Poly), Nicole Thomas (Autodesk), John Herridge (Autodesk)
 - **Date & Time:** June 20, 2022, 2:45 PM to 4:30 PM
 - **Free for Conference Attendees**
 - **Description:**
Technology is transforming the way buildings and infrastructure projects are designed, constructed, and operated. Learn how you can utilize the Autodesk Construction Cloud (ACC) to expand & transform your digital construction workflows and increase collaboration across the entire construction lifecycle. Hear about our latest curriculum offering exploring the convergence of construction and manufacturing through the lens of industrialized construction.
-

Post-Conference Workshop

Post-Conference Workshop 1: Experience a hands-on simulation of modular construction through building a LEGO project



- Moderator/Lecturer Name: Dr. Jin Ouk Choi & Kyle A. Kithas, AIA
- Organizer: UNLV's Project Management and Construction Engineering Lab (PMCEL)
- Workshop Date & Time: June 23, 2022, 09:00 AM to 11:30 AM
- Location: Thomas T. Beam Engineering Complex – Building B (TBE-B) 365
- Free for Conference Attendees
- Description:

In this workshop, the participants will experience a hands-on simulation of modular construction which will increase participants' interest and knowledge of modular construction, acknowledge the benefits of using 3D design with 4D scheduling through building a LEGO project. The participants will compete with each other in a group setting, which will be exciting. The workshop will provide a LEGO set, a laptop with a 3D model and 4D schedule, and instructions per group.

Post-Conference Workshop 2: Tutorial on Scan-to-BIM using Python and Open3D



- Moderator /Lecturer Name: Dr. Jingdao Chen
- Organizer: Computer Science and Engineering Department at Mississippi State University
- Workshop Date & Time: June 24, 2022, 09:00 AM to 11:30 AM
- Location: Thomas T. Beam Engineering Complex – Building B (TBE-B) 365
- Registration fee for the workshop: \$100
- Description: In this workshop, the participants will experience a hands-on tutorial on using open-source software tools to create Building Information Models (BIM) from 3D point clouds. The participants will use simple functions in Python and Open3D to reconstruct building walls and floors from sensor data. The tutorial will provide step-by-step instructions on how to implement common point clouds processing algorithms such as segmentation and clustering.

** Bring a laptop to this workshop.*

Social Events and Meals

A. Welcome Reception

Date and Time: June 20 (Day 1), Monday from 16:30 PM to 19:30 PM,

Location: Ballroom C

B. Breakfast

Date and Time:

June 21 (Day 2), Tuesday from 8:00 AM to 9:00 AM

June 22 (Day 3), Wednesday from 8:00 AM to 9:00 AM

Location: Ballroom

C. Lunch

Date and Time:

June 21 (Day 2), Tuesday, from 12:15 PM to 13:45 AM

June 22 (Day 3), Wednesday from 12:15 PM to 13:45 AM

Location: Ballroom

D. Banquet

Date and Time: June 22 (Day 3) from 17:30 PM to 19:30 PM

Location: Ballroom

E. Coffee and Tea Break

Date and Time:

June 20 (Day 1), Monday, 14:15 PM to 14:45 PM

June 21 (Day 2), Tuesday, 10:30 AM to 11:00 AM and 15:00 PM to 15:30 PM

June 22 (Day 3), Wednesday, 10:30 AM to 11:00 AM and 15:00 PM to 15:30 PM

Location: Prefunction Space

Technical Program

Session 1–A Day 2 11:00 AM - 12:15 PM Room 205	Visualization, Information Modeling, and Simulation (Digital Twin, AR/VR, BIM) Chairperson: Dr. Ainalem Nega
11:00 AM - 11:15 AM	S1-A1 Application of Markov Chains and Monte Carlo Simulations for Pavement Construction Engineering <i>Ainalem Nega and Daba Gedafa</i>
11:15 AM - 11:30 AM	S1-A2 BIM-GIS Interoperability for Highway Traffic Information Sharing <i>Xiaoqiang Hu, Jieyi Bao, Yi Jiang, and Shuo Li</i>
11:30 AM - 11:45 AM	S1-A3 Automated Data Analysis of Floor Plans for Remodeling of Apartment Housing <i>Seongah Kim, Wonseok Seo, Junseok Park, and Jinyoung Kim</i>
11:45 AM - 12:00 PM	S1-A4 Method to Use the Augmented Reality for Construction Planning and Management <i>Keong-Woo Nam, Chulung Kang, and Myunghoun Jang</i>
12:00 PM - 12:15 PM	S1-A5 Leveraging Reinforcement Learning for Generating Construction Workers' Moving Path: Challenges and Opportunities <i>Minguk Kim and Tae Wan Kim</i>
Session 1–B Day 2 11:00 AM - 12:15 PM Room 207	Advanced Project Management & Control (Scheduling, Estimating, QA/QC, Risk/Safety Management) Chairperson: Dr. Soowon Chang
11:00 AM - 11:15 AM	S1-B1 Prevention through Design (PtD) of Integrating Accident Precursors in BIM <i>Soowon Chang, Heung Jin Oh, and JeeHee Lee</i>
11:15 AM - 11:30 AM	S1-B2 What are the Risks of using Smart Technology in the Construction Phase? <i>Baul Lee and Seoung-Kook Park</i>
11:30 AM - 11:45 AM	S1-B3 AI-Based Project Similarity Evaluation Model Using Project Scope Statements <i>Taewoo Ko, H.David Jeong, and JeeHee Lee</i>
11:45 AM - 12:00 PM	S1-B4 Resource-constrained scheduling at different project sizes <i>Vasiliki Lazari, Athanasios Chasiakos, and Stylianos Karatzas</i>
12:00 PM - 12:15 PM	S1-B5 Analysis of Relationship Between Construction Accidents and Particle Matter Using Big Data <i>Minsu Lee, Jaewook Jeong, Jaemin Jeong, and Jaehyun Lee</i>

Session 1–C Day 2 11:00 AM - 12:15 PM Room 209	Sensing and Data Analytics for Construction (AI & Data Science) Chairperson: Dr. Fei Dai
11:00 AM - 11:15 AM	S1-C1 Automation of Roadway Lighting Illuminance Measurement <i>Jieyi Bao, Xiaoqiang Hu, Yi Jiang, and Shuo Li</i>
11:15 AM - 11:30 AM	S1-C2 Inferring Pedestrians' Emotional States through Physiological Responses to Measure Subjective Walkability Indices <i>Taeun Kim, Meesung Lee, and Sungjoo Hwang</i>
11:30 AM - 11:45 AM	S1-C3 Development of an Intellectualized Control System in Integrating Computer Vision Technology and Big Data of Safety Accidents <i>Sung Won Kang, Sung Yong Park, Jae Kwon Shin, Wi Sung Yoo, and Yoonseok Shin</i>
11:45 AM - 12:00 PM	S1-C4 Automated Phase Identification in Shingle Installation Operation Using Machine Learning <i>Amrita Dutta, Scott P. Brelloff, Fei Dai, Erik W. Sinsel, Christopher M. Warren, and John Wu</i>
12:00 PM - 12:15 PM	S1-C5 Game Engine Driven Synthetic Data Generation for Computer Vision-Based Construction Safety Monitoring <i>Heejae Lee, Jongmoo Jeon, Jaehun Yang, Chansik Park, and Dongmin Lee</i>
Session 1–D Day 2 11:00 AM - 12:15 PM Room 211	Sustainable Construction and Resilient Infrastructure/Cities/Communities Chairperson: Dr. Ahmed Abdelaty
11:00 AM - 11:15 AM	S1-D1 Long-Term Wildfire Reconstruction: In Need of Focused and Dedicated Pre-Planning Efforts <i>William Harris, Jin Ouk Choi, Jaewon Lim, and Yong-Cheol Lee</i>
11:15 AM - 11:30 AM	S1-D2 Analysis of Federal Expenses to Restore, Repair, Reconstruct, or Replace Disaster Damaged Roads and Bridges in the U.S. <i>Arkaprabha Bhattacharyya and Makarand Hastak</i>
11:30 AM - 11:45 AM	S1-D3 Cradle to Gate Emissions Modeling for Scheduling of Construction Projects <i>Achintyamugdha Sharma, Priyanka Deka, Goutam Jois, Umesh Jois, and Pei Tang</i>
11:45 AM - 12:00 PM	S1-D4 Performance Evaluation of smart intersections for emergency response time based on integration of geospatial and incident data <i>Heung Jin Oh and Baabak Ashuri</i>

12:00 PM - 12:15 PM	S1-D5	Framework to Compute Emission Costs Associated with Work Zones <i>K. Joseph Shrestha, Jeremiah Adebisi, Mohammad Uddin, and Roy Sturgill</i>
Session 1–E Day 2 11:00 AM - 12:15 PM Room 213		Automation in Construction (Robotics) Chairperson: Dr. Youjin Jang
11:00 AM - 11:15 AM	S1-E1	Experiment on the feasibility of cleaning building pipelines using ultrasonic cavitation <i>Ung-Kyun Lee, Jae-Hyun Jo, Sungchul Lee, Jae-Yeob Kim, and Kukhyun Kim</i>
11:15 AM - 11:30 AM	S1-E2	Automated Prioritization of Construction Project Requirements using Machine Learning and Fuzzy Logic System <i>Fahad Ul Hassan, Tuyen Le, Chau Le, and K. Joseph Shrestha</i>
11:30 AM - 11:45 AM	S1-E3	A Low-Cost Approach for Path Programming of Terrestrial Drones on a Construction Site <i>Jeffrey Kim and James Craig</i>
11:45 AM - 12:00 PM	S1-E4	Multi-camera-based 3D human pose estimation for close-proximity human-robot collaboration in construction <i>Sajib Sarkar, Youjin Jang, and Inbae Jeong</i>
12:00 PM - 12:15 PM	S1-E5	An algorithm of marking line correction for robot-based layout automation of building structures <i>Hyunsu Lim, Taehoon Kim, Kyuman Cho, Taehoon Kim, and Chang-Won Kim</i>
Session 1–F Day 2 11:00 AM - 12:15 PM Ballroom		AGC Case Study Session Chairperson: Dr. John Schaufelberger
11:00 AM - 12:15 PM	S1-F1	Adding AGC Case Studies to the Educator's Tool Chest <i>John Schaufelberger, Zofia K. Rybkowski, and Caroline Clevenger</i>

Session 2–A Day 2 01:45 PM - 03:00 PM Room 205	Visualization, Information Modeling, and Simulation (Digital Twin, AR/VR, BIM) Chairperson: Dr. Joseph Shrestha
01:45 PM - 02:00 PM	S2-A1 An Agent-Based Framework for Investigating Safety-Productivity Tradeoff of Construction Laborers Considering Risk-taking Behavioral Heterogeneity <i>Ali Khodabandelu, Jee Woong Park, and Seyedmohsen Kheyrandish</i>
02:00 PM - 02:15 PM	S2-A2 Multi-family Residential Construction Management Practice in the U.S. <i>Namho Cho</i>
02:15 PM - 02:30 PM	S2-A3 Automation technology for analyzing 3D point cloud data of construction sites <i>Su Yeul Park, Yong Gun Kim, Yeong Jun Choi, and Seok Kim</i>
02:30 PM - 02:45 PM	S2-A4 Construction Cost Segregation Process using Building Information Modeling <i>Rong Zhou, Huimin Li, Chengyi Zhang, Lelin Lv, Junrui Tian, and Sevilyay Demirkesen</i>
02:45 PM - 03:00 PM	S2-A5 Enhancing the digitization of cultural heritage: State-of-Practice <i>Thu Anh Nguyen, Anh Hoang Trinh, and Truong-An Pham</i>
Session 2–B Day 2 01:45 PM - 03:00 PM Room 207	Advanced Project Management & Control (Scheduling, Estimating, QA/QC, Risk/Safety Management) Chairperson: Dr. Tae Wan Kim
01:45 PM - 02:00 PM	S2-B1 Integrated Object Detection and Blockchain Framework for Remote Safety Inspection at Construction Sites <i>Dohyeong Kim, Jaehun Yang, Sharjeel Anjum, Dongmin Lee, Jae-Ho Pyeon, Chansik Park, and Doyeop Lee</i>
02:00 PM - 02:15 PM	S2-B2 Identification of Influencing Factors on the Operability of PC Construction Shipment Request Forms <i>Eunbeen Jeong, Junyoung Jang, and Tae Wan Kim</i>
02:15 PM - 02:30 PM	S2-B3 A Study on the Application of Smart Safety Technology at Construction Sites in South Korea <i>Ji-Sun Choi, Hoon-Hee Hwang, and Suzy Ryu</i>
02:30 PM - 02:45 PM	S2-B4 Ontology based Integrated Construction Information Management for Modernized Traditional Housing (Hanok) <i>Heewoo Lee, Yunsub Lee, Zhenhui Jin, Youngsoo Jung, and Dagem Derese Gebremichael</i>

02:45 PM - 03:00 PM	S2-B5	An Exploratory Study of EVMS Environment Factors and their Impact on Cost Performance for Construction and Environmental Projects <i>Vartenie Aramali, Hala Sanboskani, G. Edward Gibson Jr., and Mounir El Asmar</i>
Session 2–C Day 2 01:45 PM - 03:00 PM Room 209		Sensing and Data Analytics for Construction (AI & Data Science) Chairperson: Dr. Chau Le
01:45 PM - 02:00 PM	S2-C1	Automated Construction Activities Extraction from Accident Reports Using Deep Neural Network and Natural Language Processing Techniques <i>Quan Do, Tuyen Le, and Chau Le</i>
02:00 PM - 02:15 PM	S2-C2	Automatic space type classification of architectural BIM models using Graph Convolutional Networks <i>Youngsu Yu, Sihyun Kim, Wonbok Lee, Haein Jeon, and Bonsang Koo</i>
02:15 PM - 02:30 PM	S2-C3	How to measure alert fatigue by using physiological signals? <i>Jeonghyeun Chae and Youngcheol Kang</i>
02:30 PM - 02:45 PM	S2-C4	A Hybrid Semantic-Geometric Approach for Clutter-Resistant Floorplan Generation from Building Point Clouds <i>Seongyong Kim, Yosuke Yajima, Jisoo Park, Jingdao Chen, and Yong K. Cho</i>
02:45 PM - 03:00 PM	S2-C5	The Status Quo of Graph Databases in Construction Research <i>Kahyun Jeon and Ghang Lee</i>
Session 2–D Day 2 01:45 PM - 03:00 PM Room 211		Sustainable Construction and Resilient Infrastructure/Cities/Communities Chairperson: Dr. Joseph Kim
01:45 PM - 02:00 PM	S2-D1	A scientometric and Meta-analysis of Rail Infrastructure in Nigeria <i>Imoleayo Abraham Awodele and Modupe Cecilia Mewomo</i>
02:00 PM - 02:15 PM	S2-D2	Sustainability Appraisal of Chinese Railway Projects In Nigeria: Afoot <i>Imoleayo Abraham Awodele and Modupe Cecilia Mewomo</i>
02:15 PM - 02:30 PM	S2-D3	Optimal installation of electric vehicle charging stations connected with rooftop photovoltaic (PV) systems: a case study <i>Jae Heo and Soowon Chang</i>

02:30 PM - 02:45 PM	S2-D4	Evaluating Sustainability Rating System for California Infrastructure Construction Projects <i>Patricia McCarthy and Joseph Kim</i>
02:45 PM - 03:00 PM	S2-D5	Conceptualizing a Strategic Facilities Management Decision Framework for Heritage Building Maintenance Management <i>Mayowa I. Adegoriola, Esther H.K Yung, Joseph H.K Lai, and Edwin Chan</i>
Session 2–E Day 2 01:45 PM - 03:00 PM Room 213	Lean Design and Construction Chairperson: Dr. Zofia Rybkowski	
01:45 PM - 02:00 PM	S2-E1	3D Online Marshmallow Simulation Game for Target Value Design <i>Suryeon Kim, Pete Mainardi, David Jeong, Zofia Rybkowski, and Jinsil Seo</i>
02:00 PM - 02:15 PM	S2-E2	A Comparative Analysis of Integrated Project Delivery in Construction Versus Traditional Methods <i>Anthony Peressini, James Bristow, Mahmoud Motahari, and Moses Karakouzian</i>
02:15 PM - 02:30 PM	S2-E3	Challenges and Future of Prefabricated Pipe Spools <i>Sahil Tadwalkar, Yujin Lee, and Martin Fischer</i>
02:30 PM - 02:45 PM	S2-E4	'Knowing' with AI in construction – An empirical insight <i>Shobha Ramalingam and Alan Mossman</i>
02:45 PM - 03:00 PM	S2-E5	To Study the Effect on Concrete Strength by Adding Waste Rubber Material from Worn Out Tires <i>Muhammad Aleem, Naeem Ejaz, Nasir Sadiq Janjua, Tanveer Gill, and Muhammad Yasir Sadiq</i>
Session 3–A Day 2 03:30 PM - 04:45 PM Room 205	Visualization, Information Modeling, and Simulation (Digital Twin, AR/VR, BIM) Chairperson: Dr. Krishna Kisi	
03:30 PM - 03:45 PM	S3-A1	How to automatically extract 2D deliverables from BIM? <i>Yije Kim and Sangyoon Chin</i>
03:45 PM - 04:00 PM	S3-A2	Virtual reality safety training on multiple platforms <i>Lan Bao Quy, Si Tran Van Tien, Linh Nguyen Truong, and Chansik Park</i>

04:00 PM - 04:15 PM	S3-A3	BIM Awareness Assessment among Hydropower Professionals in Nepal <i>Sushmit Sharma Bhattarai and Krishna Kisi</i>
04:15 PM - 04:30 PM	S3-A4	Demystifying the Definition of Digital Twin for Built Environment <i>Saman Davari, Mehrzad Shahinmogahdam, Ali Motamedi, and Erik Poirier</i>
04:30 PM - 04:45 PM	S3-A5	A formal representation of data exchange for slope stability analysis of smart road design and construction <i>Ke Dai, Wuhao Huang, Ya Wen, Yuru Xie, and Jung In Kim</i>
Session 3-B Day 2 03:30 PM - 05:00 PM Room 207		Advanced Project Management & Control (Scheduling, Estimating, QA/QC, Risk/Safety Management) Chairperson: Dr. Ahmed Abdelaty
03:30 PM - 03:45 PM	S3-B1	Measuring the Impact of Change Orders on Project Performances by Building Type <i>Marcus Juarez and Joseph Kim</i>
03:45 PM - 04:00 PM	S3-B2	Examining Change Order Reasons for Non-Structural Utility Support Projects in Healthcare Facilities <i>Naomi Genota and Joseph Kim</i>
04:00 PM - 04:15 PM	S3-B3	Construction Cost Forensics: How Best To Protect Your Company And Avoid Costly Problems <i>Neil Opfer</i>
04:15 PM - 04:30 PM	S3-B4	Framework for improving the prediction rate with respect to outdoor thermal comfort using using machine learning <i>Jaemin Jeong, Jaewook Jeong, Minsu Lee and Jaehyun Lee</i>
04:30 PM - 04:45 PM	S3-B5	Risk Analysis on Offshore Windfarm Industry in South Korea: Based on the Jeonnam Offshore Windfarm Project <i>Tae Hyun Kim, Yea Sang Kim, Sangyoon Chin, and Kristian Pallesen</i>
04:45 PM - 05:00 PM	S3-B6	Assessing Critical Quality Metrics for Successful Baseline Construction Scheduling <i>John Bivans and Jin Ouk Choi</i>

Session 3–C Day 2 03:30 PM - 05:00 PM Room 209	Sensing and Data Analytics for Construction (AI & Data Science) Chairperson: Dr. Zhenhua Zhu
03:30 PM - 03:45 PM	S3-C1 Tack Coat Inspection Using Unmanned Aerial Vehicle and Deep Learning <i>Aida da Silva, Fei Dai and Zhenhua Zhu</i>
03:45 PM - 04:00 PM	S3-C2 Linking LOD and MEP items towards an automated LOD elaboration of MEP design <i>Minso Shin, Seonghun Park, and Tae Wan Kim</i>
04:00 PM - 04:15 PM	S3-C3 Identification of target subjects and their constraints for automated MEP routing in an AEC project <i>Seonghun Park, MinSo Shin, and Taewan Kim</i>
04:15 PM - 04:30 PM	S3-C4 Compound Loss Function of semantic segmentation models for imbalanced construction data <i>Wei Chih Chern, Hongjo Kim, Vijayan Asari, and Tam Nguyen</i>
04:30 PM - 04:45 PM	S3-C5 Image-based Extraction of Histogram Index for Concrete Crack Analysis <i>Bubryur Kim and Dong-Eun Lee</i>
04:45 PM - 05:00 PM	S3-C6 Application of Big Data and Machine-learning (ML) Technology to Mitigate Contractor’s Design Risks for Engineering, Procurement, and Construction (EPC) Projects <i>Seong-Jun Choi, Min-Ji Park, So-Won Choi, and Eul-Bum Lee</i>
Session 3–D Day 2 03:30 PM - 05:00 PM Room 211	Sustainable Construction and Resilient Infrastructure/Cities/Communities Chairperson: Dr. Kishor Shrestha
03:30 PM - 03:45 PM	S3-D1 Analysis of project-level indicators of a smart city <i>Krishna Kisi and Sushmit Sharma Bhattarai</i>
03:45 PM - 04:00 PM	S3-D2 Trend Analysis of LEED Certifications: Insights and Future <i>Seungmin Lee and Young Hoon Kwak</i>
04:00 PM - 04:15 PM	S3-D3 Impact of Bridge Construction on County Population in Georgia <i>M. Myung Jeong, Mignon Kang, and Younghan Jung</i>
04:15 PM - 04:30 PM	S3-D4 Interlocking Earthen Masonry Units for Sustainable Residential Building Construction <i>Noah Lubbering, Ibukun Awolusi, Sandeep Langar, and Arturo Schultz</i>

04:30 PM - 04:45 PM	S3-D5	Evaluating the Impact of Transportation Infrastructures on Social Equity: A Review Study <i>Kishor Shrestha and Feras Arnaout</i>
04:45 PM - 05:00 PM	S3-D6	The Performance Analysis to Identify the Reuse and Assembly Impact of Temporary Equipment <i>Sung-Jae Bae, Jun-Beom Park, Jung-Yeol Kim, Young-Suk Kim, and Jun-Sang Kim, and Jae-Hun Jo</i>
Session 3-E Day 2 03:30 PM - 04:45 PM Room 213	Automation in Construction (Robotics) Chairperson: Dr. Jingdao Chen	
03:30 PM - 03:45 PM	S3-E1	The Current State and Future Directions of Industrial Robotic Arms in Modular Construction <i>Seung Ho Song, Jin Ouk Choi, and Seungtaek Lee</i>
03:45 PM - 04:00 PM	S3-E2	Skeleton Model-based Unsafe Behaviors Detection at construction site scaffold <i>Truong Linh Nguyen, Si Van-Tien Tran, Quy Lan Bao, Doyeob Lee, MyoungHo Oh, and Chansik Park</i>
04:00 PM - 04:15 PM	S3-E3	A Framework of Function Analysis for the Construction Robotics Design <i>Chang-Yong Yi, Young-Jun Park, Jin-Young Park, Chan-Young Park, and Dong-Eun Lee</i>
04:15 PM - 04:30 PM	S3-E4	Building a Big Data Platform by Real-time Wearable Devices and Knowledgeable Cases of Safety Accidents <i>Ki Seok Lee, Youngjin Choi, Kyung-cheun Lee, Yoonseok Shin and Wi Sung Yoo</i>
04:30 PM - 04:45 PM	S3-E5	AprilTag and Stereo Visual Inertial Odometry (A-SVIO) based Mobile Assets Localization at Indoor Construction Sites <i>Rabia Khalid, Muhammad Khan, Sharjeel Anjum, Junsung Park, Doyeop Lee, and Chansik Park</i>
04:45 PM - 05:00 PM	S3-E6	A Worker-Driven Approach for Opening Detection by Integrating Computer Vision and Built-in Inertia Sensors on Embedded Devices <i>Sharjeel Anjum, Muhammad Sibtain, Rabia Khalid, Muhammad Khan, Doyeop Lee, and Chansik Park</i>

Session 4–A Day 3 11:00 AM - 12:15 PM Room 205	Visualization, Information Modeling, and Simulation (Digital Twin, AR/VR, BIM) Chairperson: Dr. Man-Woo Park
11:00 AM - 11:15 AM	S4-A1 An Exploratory Study on 3D-based Building Information Management for Multi-User Fire Protection System <i>Heesung Cha and Dahee Kim</i>
11:15 AM - 11:30 AM	S4-A2 The Development of a Haptic Interface for Interacting with BIM Elements in Mixed Reality <i>Jaehong Cho, Sehun Kim, Namyoung Kim, Sungpyo Kim, Chaehyeon Park, Jisun Lim, and Sanghyeok Kang</i>
11:30 AM - 11:45 AM	S4-A3 Augmented Reality Framework for Data Visualization Based on Object Detection and Digital Twins <i>Hung Pham, Linh Nguyen, Nhut Huynh, Yong-Ju Lee, and Man-Woo Park</i>
11:45 AM - 12:00 PM	S4-A4 Construction performance assessment framework by means of construction simulation for earthwork operations <i>Yujin Kim, Jaeyun Noh, Yongho Ko, Jaewoo Lee, and Sengwoo Han</i>
12:00 PM - 12:15 PM	S4-A5 Indoor Semantic Data Decton and Indoor Spatial Data Update through Artificial Intelligence and Augmented Reality Technology <i>Sun Kwon</i>
Session 4–B Day 3 11:00 AM - 12:15 PM Room 207	Advanced Project Management & Control (Scheduling, Estimating, QA/QC, Risk/Safety Management) Chairperson: Dr. Jeehee Lee
11:00 AM - 11:15 AM	S4-B1 A Classification Model for Predicting the Injured Body Part in Construction Accidents in Korea <i>Jiseon Lim, Sungjin Choi, and Sanghyeok Kang</i>
11:15 AM - 11:30 AM	S4-B2 Uncertainty Factors affecting Bid Price from Pre-bid Clarification Document of Transport Construction Projects <i>Ye Eun Jang, Ha Young Kim, June-Seong Yi, and Bum-Sik Lee</i>
11:30 AM - 11:45 AM	S4-B3 Development of Semantic Risk Breakdown Structure to Support Risk Identification for Bridge Projects <i>Muritala Adebayo Isah, Byung-Ju Jeon, Yang Liu, and Byung-Soo Kim</i>

11:45 AM - 12:00 PM	S4-B4	Integrating Deep Learning with Web-Based Price Analysis to Support Cost Estimation <i>Musa Ayuba Musa and Temitope Akanbi</i>
12:00 PM - 12:15 PM	S4-B5	Ontology for estimating excavation duration for smart construction of hard rock tunnel projects under resource constraint <i>Shuhan Yang, Zhihao Ren, and Jung In Kim</i>
Session 4–C Day 3 11:00 AM - 12:15 PM Room 209	Sensing and Data Analytics for Construction (AI & Data Science) Chairperson: Dr. Soowon Chang	
11:00 AM - 11:15 AM	S4-C1	Incorporating Machine Learning into a Data Warehouse for Real-Time Construction Projects Benchmarking <i>Zhe Yin, Deborah DeGezelle, Kazuma Hirota, and Jiyong Choi</i>
11:15 AM - 11:30 AM	S4-C2	Human Pose-based Labor Productivity Measurement Model <i>Byoungmin Lee, Sebeen Yoon, Soun Jo, Taehoon Kim, and Jongho Ock</i>
11:30 AM - 11:45 AM	S4-C3	Pilot Experiment for Named Entity Recognition of Construction-related Organizations from Unstructured Text Data <i>Seungwon Baek, Seung Heon Han, Wooyong Jung, and Yuri Kim</i>
11:45 AM - 12:00 PM	S4-C4	Assessing the Human Perceptions of Physical Environmental Stressors Through Behavior Response Examination <i>Siyeon Kim, Yeon Joo Kim, Hyunsoo Kim, and Sungjoo Hwang</i>
12:00 PM - 12:15 PM	S4-C5	Analysis of the Effects of Walking Environment Components on Pedestrian Satisfaction and Dissatisfaction <i>Meesung Lee, Heejung Lee, Taeun Kim, and Sungjoo Hwang</i>
Session 4–D Day 3 11:00 AM - 12:15 PM Room 211	Construction in Extreme Environments (Future of Space Exploration) Chairperson: Dr. Pramen P. Shrestha	
11:00 AM - 11:15 AM	S4-D1	Finite Element Analysis of Carbon Fiber Composite Sandwich Panels Subjected to Wind Debris Impacts <i>Bi Zhang and Ajay Shanker</i>
11:15 AM - 11:30 AM	S4-D2	Simulation and Analysis of Wildfire for Control and Management <i>Fan Yang and Jiansong Zhang</i>

11:30 AM - 11:45 AM	S4-D3	The Impact of Fatigue on Hazard Recognition: An Objective Pilot Study <i>Abdullahi Ibrahim, Ifeanyi Okpala, Chukwuma Nnaji, Mostafa Namian, and Amanda Koh</i>
11:45 AM - 12:00 PM	S4-D4	Factors that impact construction workers' hazard recognition ability and their technological solutions <i>Bandana Shrestha, Jee Woong Park, and Pramen P Shrestha</i>
12:00 PM - 12:15 PM	S4-D5	Construction Ergonomic Intervention to Reduce Musculoskeletal Disorders in Aluminum Formworkers <i>Dae Yong Kim, Hak Yi, Sang Ryong Lee, Bubryur Kim, and Dong-Eun Lee</i>
Session 4–E Day 3 11:00 AM - 12:15 PM Room 213	Education and Diversity/Inclusion in Construction Workforce Chairperson: Dr. Ibukun Awolusi	
11:00 AM - 11:15 AM	S4-E1	Hands-on Education Module for Modular Construction, 3D Design, and 4D Schedule <i>Kyle Kithas and Jin Ouk Choi</i>
11:15 AM - 11:30 AM	S4-E2	College Students' Workload and Productivity for Different Types of Tasks before and during COVID-19 Pandemic in the U.S. <i>Chi Tian, Hongyue Wu, and Yunfeng Chen</i>
11:30 AM - 11:45 AM	S4-E3	Safety Education in the Curriculum of Construction Programs <i>Ibukun Awolusi, Tulio Sulbaran, Siyuan Song, Chukwuma Nnaji, and Mohammadreza Ostadalimakhmalbaf</i>
11:45 AM - 12:00 PM	S4-E4	COVID-19's Rapid Digitalization of Education: Instructor Experience in Kwazulu-Natal, South Africa <i>Ayesha Mall and Theodore C Haupt</i>
12:00 PM - 12:15 PM	S4-E5	Workload and Productivity during Work from Home (WFH) for the Construction Workforce <i>Hongyue Wu and Yunfeng Chen</i>
Session 4–F Day 3 11:00 AM - 11:45 AM Ballroom	CM Study Abroad Session Chairperson: Professor Steve Rogers	
11:00 AM - 11:15 AM	S4-F1	Constructionarium: Turning Theory Into Practice <i>Julia Stevens</i>

11:15 AM - 11:30 AM	S4-F2	International Study and Transformational Learning: What Covid-19 Has Taught Us <i>Steve Rodgers</i>
11:30 AM - 11:45 AM	S4-F3	Management of Change in the Era of Pandemic <i>Steve Lowy</i>
Session 5–A Day 3 01:45 PM - 03:00 PM Room 205	Visualization, Information Modeling, and Simulation (Digital Twin, AR/VR, BIM) Chairperson: Dr. Inbae Jeong	
01:45 PM - 02:00 PM	S5-A1	A framework for computer vision-aided construction safety monitoring using 4D BIM <i>Si Tran, Quy Lan Bao, Truong Linh Nguyen, and Chansik Park</i>
02:00 PM - 02:15 PM	S5-A2	Hazard Recognition and Construction Safety Training Efficacy using Interactive Virtual Reality (VR) <i>Meeranali Saiyad and Zofia Rybkowski</i>
02:15 PM - 02:30 PM	S5-A3	Generating a simplistic 3D model for mobile platform applications <i>Naveed Ahmed, Jee Woong Park, and Brendan Morris</i>
02:30 PM - 02:45 PM	S5-A4	AR-based 3D Digital Map Visualization Support Technology for Field Application of Smart Construction Technology <i>Jinwoo Song, Jungtaek Hong, and Soonwook Kwon</i>
02:45 PM - 03:00 PM	S5-A5	Evaluating Staircase Safety Using BIM-based Virtual Simulation: Focusing on the Elderly in the Republic of Korea <i>Hyuncheul Yang, Kwangbok Jeong, Sohyun Kim, and Jaewook Lee</i>
Session 5–B Day 3 01:45 PM - 03:00 PM Room 207	Advanced Project Management & Control (Scheduling, Estimating, QA/QC, Risk/Safety Management) Chairperson: Dr. Changbum Ryan Ahn	
01:45 PM - 02:00 PM	S5-B1	Construction Workers' Sensation-Seeking and Inattentiveness to Warning Alarms from Construction Vehicles <i>Namgyun Kim, Laurent Grégoire, Brian Anderson, and Changbum Ryan Ahn</i>
02:00 PM - 02:15 PM	S5-B2	Measuring the Impact of Supply Network Topology on the Material Delivery Robustness in Construction Projects <i>Chan Heo, Changbum Ahn, Minhyeok Jung, Moonseo Park, and Sungboo Yoon</i>

02:15 PM - 02:30 PM	S5-B3	A Summarhuhy of History and Evolution of Project Management Tools towards Reinforcement-Learning-based Technologies <i>Arnold Jan Bitangjol, Kanghyeok Lee, Jungeun Hwang, and Do Hyoung Shin</i>
02:30 PM - 02:45 PM	S5-B4	A Descriptive Analysis of Project Participants' Perception about Complaint in Public Construction Projects <i>Changjun Lee, Ju-Hui Lee, Sungmin Yun, and Seung Heon Han</i>
02:45 PM - 03:00 PM	S5-B5	Impact Analysis of Construction Delay: The Case of Defects In the Top-down Construction Method <i>Janghwan Suk, Woobin Kwon, Jang-Woo Soe, and Hunhee Cho</i>
Session 5-C Day 3 01:45 PM - 03:00 PM Room 209	Sensing and Data Analytics for Construction (AI & Data Science) Chairperson: Dr. Jingdao Chen	
01:45 PM - 02:00 PM	S5-C1	Automated Analysis of Scaffold Joint Installation Status of UAV-Acquired Images <i>Sunwoong Paik, Yohan Kim, Juhyeon Kim, and Hyoungkwan Kim</i>
02:00 PM - 02:15 PM	S5-C2	Vision-Based Activity Recognition Monitoring Based on Human-Object Interaction at Construction Sites <i>Yeon Chae, Hoonyong Lee, Changbum Ahn, Minhyuk Jung, and Moonseo Park</i>
02:15 PM - 02:30 PM	S5-C3	Automatic linkage method between email and block structure to store construction project documents in the blockchain <i>Eu Wang Kim, Min Seo Park, Jong Inn Kim, Ameng Wei, Kyoungmin Kim, and Kyong Ju Kim</i>
02:30 PM - 02:45 PM	S5-C4	Collision Hazards Detection for Construction Workers Safety Using Equipment Sound Data <i>Kehinde Elelu, Tuyen Le and Chau Le</i>
02:45 PM - 03:00 PM	S5-C5	Enhancing occlusion robustness for vision-based construction worker detection using data augmentation <i>Yoojun Kim, Hyunjun Kim, Sunghan Sim, and Youngjib Ham</i>
Session 5-D Day 3 01:45 PM - 03:00 PM Room 211	Advanced Project Delivery and Contracting Chairperson: Dr. Jeehee Lee	
01:45 PM - 02:00 PM	S5-D1	Comparison of Asset Management Approaches to Optimize Navigable Waterway Infrastructure <i>Bukola Oni, Katherine Madson, and Cameron MacKenzie</i>
02:00 PM - 02:15 PM	S5-D2	Detecting Red-Flag Bidding Patterns in Low-Bid Procurement for Highway Projects with Pattern Mining <i>Chau Le, Trang Nguyen, and Tuyen Le</i>

02:15 PM - 02:30 PM	S5-D3	Assessing Contractor Competition in Competitive Bidding for Highway Construction Projects Using Network Analysis <i>Chau Le, Minakshi Arya, Muhammad Ali Moriyani, and Tuyen Le</i>
02:30 PM - 02:45 PM	S5-D4	Investigation on Uncertainty in Construction Bid Documents <i>Rabin Shrestha and JeeHee Lee</i>
02:45 PM - 03:00 PM	S5-D5	South-South Collaborations: Policy Recommendations for Sustainable Win-Win Infrastructure Partnerships Based on Sino - Ghana and Nigeria Case. <i>Bridget Eshun, Albert P.C. Chan, Daniel Oteng, and Maxwell Fordjour Antwi-Afari</i>
Session 5–E Day 3 01:45 PM - 03:00 PM Room 213	Education and Diversity/Inclusion in Construction Workforce & Industry Case Studies Chairperson: Dr. Kishor Shrestha	
01:45 PM - 02:00 PM	S5-E1	Factors Affecting Delay on Public Transportation Projects in Short Construction Seasons <i>Md Shah Jamal, Ahmed Abdelaty, and Joseph Shrestha</i>
02:00 PM - 02:15 PM	S5-E2	Customized Safety Information Delivery System for Unskilled Construction Worker Training <i>Junhyeon Jo, Sangeun Baik, Doyeop Lee, Chansik Park, and Akeem Pedro</i>
02:15 PM - 02:30 PM	S5-E3	Investigating the Maintenance Cost of Rest Areas: A Case Study of Nevada <i>Kishor Shrestha and Pramen Shrestha</i>
02:30 PM - 02:45 PM	S5-E4	Potential of Interactive Metaverse Platform for Safety Education in Construction <i>Taehan Yoo, Dongmin Lee, Jaehun Yang, Doyeop Lee, Chansik Park, and Dohyung Kim</i>
02:45 PM - 03:00 PM	S5-E5	Resource and Sequence Optimization using constraint programming in construction projects <i>Junyoung Kim, Moonseo Park, Changbum Ahn, Minhyuk Jung, Seonu Joo, and Inseok Yoon</i>
Session 6–A Day 3 03:30 PM - 05:00 PM Room 205	Building Science (Energy Modeling, Facility Management) Chairperson: Dr. Kyubyeung Kang	

03:30 PM - 03:45 PM	S6-A1	Blockchain framework for occupant-centered indoor environment control using IoT sensors <i>Jaewon Jeoung, Taehoon Hong, Seunghoon Jung, Hyuna Kang, Hakpyeong Kim, Minjin Kong, and Jinwoo Choi</i>
03:45 PM - 04:00 PM	S6-A2	Applications of Agent-Based Modeling (ABM) in Enhancing Facility Operation and Management <i>Ali Khodabandelu and Jee Woong Park</i>
04:00 PM - 04:15 PM	S6-A3	ALTERNATIVE STRATEGIES TO CENTRAL HVAC <i>Pramen Shrestha and Mythili Pragada</i>
04:15 PM - 04:30 PM	S6-A4	A multi-level Digital Twin for optimising demand response at the local level without compromising the well-being of consumers <i>Niall Byrne, Athanasios Chasiakos, Stylianos Karatzas, David Sweeney, Vassiliki Lazari, Anastasios Karameros, Giovanni Tardioli, and Adalberto Guerra Cabrera</i>
04:30 PM - 04:45 PM	S6-A5	BIM-based property management by linking maintenance with financial data for commercial building projects <i>Hyeonju Shin and Heesung Cha</i>
04:45 PM - 05:00 PM	S6-A6	Recognition of Occupants' Cold Discomfort-Related Actions for Energy-Efficient Buildings <i>Kwonsik Song, Kyubyung Kang, and Byung-Cheol Min</i>
Session 6–B Day 3 03:30 PM - 05:00 PM Room 207	Industrialized and Modular Construction Chairperson: Dr. Koji Tanaka	
03:30 PM - 03:45 PM	S6-B1	Cutting-edge Technologies to Achieve a Higher Level of Modular Construction – Literature Review <i>Seungtaek Lee, Jin Ouk Choi, and Seung Ho Song</i>
03:45 PM - 04:00 PM	S6-B2	Lessons Learned during the Early Phases of a Modular Project: A Case Study of UNLV's Solar Decathlon 2020 Project <i>Jin Ouk Choi, Seungtaek Lee, and Eric Weber</i>
04:00 PM - 04:15 PM	S6-B3	Critical assessment of programme-based conflict resolution model applied to multiple stakeholders within the context of industrialized building production and life cycle supply chain system <i>Koji Tanaka</i>
04:15 PM - 04:30 PM	S6-B4	Analysis of a Long Volumetric Module Lift Using Single and Multiple Cranes <i>Ali Khodabandelu, Jee Woong Park, Jin Ouk Choi, and Mahsa Sanei</i>

04:30 PM - 04:45 PM	S6-B5	Steel Module-to-Concrete Core Connection Methods in High Rise Modular Buildings: A Critical Review <i>Bishal Poudel, Seungtaek Lee, and Jin Ouk Choi</i>
04:45 PM - 05:00 PM	S6-B6	Worker Safety in Modular Construction: Investigating Accident Trends, Safety Risk Factors, and Potential Role of Smart Technologies <i>Muhammad Khan, Evan Mccrary, Chukwuma Nnaji, and Ibukun Awolusi</i>
Session 6–C Day 3 03:30 PM - 05:00 PM Room 209	Sensing and Data Analytics for Construction (AI & Data Science) Chairperson: Dr. Jeehee Lee	
03:30 PM - 03:45 PM	S6-C1	Computer Vision-based Continuous Large-scale Site Monitoring System through Edge Computing and Small-Object Detection <i>Yeonjoo Kim, Siyeon Kim, Sungjoo Hwang, and Seok Hwan Hong</i>
03:45 PM - 04:00 PM	S6-C2	Social Media Analytics to Understand the Construction Industry Sentiments <i>K. Joseph Shrestha, Nirajan Mani, Krishna Kisi, and Ahmed Abdelaty</i>
04:00 PM - 04:15 PM	S6-C3	Inferring Pedestrian Level of Service for Pathways through Electrodermal Activity Monitoring <i>Heejung Lee and Sungjoo Hwang</i>
04:15 PM - 04:30 PM	S6-C4	Blind Drift Calibration using Deep Learning Approach to Conventional Sensors on Structural Model <i>Jacob Kutchi, Kendall Robbins, David De Leon, Michael Seek, Younghan Jung, Lei Qian, Richard Mu, Liang Hong and Yaohang Li</i>
04:30 PM - 04:45 PM	S6-C5	Development of Detailed Design Automation Technology for AI-based Exterior Wall Panels and its Backframes <i>Ha Young Kim and June-Seong Yi</i>
04:45 PM - 05:00 PM	S6-C6	A Study on Displacement Measurement Hardware of Retaining Walls based on Laser Sensor for Small and Medium-sized Urban Construction Sites <i>Jun-Sang Kim, Jung-Yeol Kim and Young-Suk Kim</i>
Session 6–D Day 3 03:30 PM - 05:00 PM Room 211	Advanced Project Delivery and Contracting Chairperson: Dr. Youngcheol Kang	
03:30 PM - 03:45 PM	S6-D1	A Study on the Characteristics of "Early Contractor Involvement Method" in Public Project in Japan <i>Atsushi Tamura</i>

03:45 PM - 04:00 PM	S6-D2	Cost and Schedule Analysis of highway projects based on project types <i>Bandana Shrestha and Pramen Shrestha</i>
04:00 PM - 04:15 PM	S6-D3	Systematic literature review for the application of artificial intelligence to the management of construction claims and disputes <i>Wonkyoung Seo and Youngcheol Kang</i>
04:15 PM - 04:30 PM	S6-D4	Progressive Design-Build: Its Functions as a Contracting Method and the Four Pillars of Project Success <i>Euiseok Jeong, Connor Anderson, Ken-Yu Lin, and Giovanni C Migliaccio</i>
04:30 PM - 04:45 PM	S6-D5	Identification of Critical Success Factors (CSFs) for Public-Private Partnerships across infrastructure sectors <i>Bandana Shrestha and Pramen Shrestha</i>
04:45 PM - 05:00 PM	S6-D6	Exploring Long-Term Performance in Design-Build Best-Value Evaluation Criteria <i>Maria Calahorra-Jimenez</i>
Session 6–E Day 3 03:30 PM - 04:45 PM Room 213	Industry Case Studies Chairperson: Dr. Youjin Jang	
03:30 PM - 03:45 PM	S6-E1	Korean Engineering Firms' Competitiveness Change for the Last Decade <i>Mincheol Jung, Handon Kim, Jimin Kim, Hyounseung Jang, Hyunsang Cho, Seun Choi, and Donggeun Oh</i>
03:45 PM - 04:00 PM	S6-E2	Cost Normalization Framework for a Benchmarking System: A Case for Downstream and Chemical Construction Projects <i>Zhe Yin, Deborah DeGezelle, Mike Pappas, and Carlos Caldas</i>
04:00 PM - 04:15 PM	S6-E3	Productivity Analysis of Spray Task in an International Airport <i>Krishna Kisi and Rujan Kayastha</i>
04:15 PM - 04:30 PM	S6-E4	Comparing the Operation Cost of Washington Safety Rest Areas with Other States Using Performance-Based Method <i>Kishor Shrestha, Alix Berg, Mohammadsoroush Tafazzoli, and Krishna Kisi</i>
04:30 PM - 04:45 PM	S6-E5	COVID-19's effect on a hotel construction: a case study <i>Rujan Kayastha and Krishna Kisi</i>

Health Protocols

- ICCEPM 2022 will follow applicable federal, state, and local laws. We will monitor and adjust plans and health protocols as necessary. We encourage attendees to get COVID-19 shots at least two weeks before the conference.
- Currently, masks are NOT required in public places. But ICCEPM 2022 recommends attendees wear a mask to protect themselves. However, we will not make it mandatory.
- International arrivals require COVID testing and vaccination before entering the USA by the government, but there are no travel bans against specific nations. Fully vaccinated international travelers are now allowed entry into the United States, including Las Vegas.
- There are no restrictions on domestic travel to Las Vegas or the state of Nevada. While the state will no longer require masks in public places, there are locations where Nevadans and visitors may still be asked to wear a mask.
- UNLV strongly encourages individuals to continue to wear masks when indoors, and where social distancing is not possible.

Shuttle Service Schedule

Complimentary transportation service will be available between three conference hotels and the conference venue during the official conference duration (June 20 to June 22). We have arranged two large coach buses to make your trip easy and convenient between your hotel and the conference venue - UNLV Student Union.

1) June 20, Monday, 4:30 pm – 6:30 pm:

- a) one coach connecting DoubleTree and UNLV Student Union (SU) – departs from SU at 4:40 pm, 5:00 pm, 5:20 pm, 5:40 pm, 6:00 pm, and 6:20 pm (one way).

b) one coach connecting Residence Inn, Hyatt Place, and Student Union – departs from SU at 4:40 pm, 5:05 pm, 5:30 pm, 5:55 pm, and 6:20 pm (one way).

2) June 21, Tuesday, 7:30 am – 9:30 am:

a) one coach connecting DoubleTree and UNLV Student Union (first departs from DoubleTree) – departs from DoubleTree at 7:30 am, 7:45 am, 8:00 am, 8:15 am, 8:30 am, 8:45 am, 9:00 am, and 9:15 am (one way).

b) one coach connecting Residence Inn, Hyatt Place, and Student Union (first departs Residence Inn) – departs from Residence Inn at 7:30 am, 7:55 am, 8:20 am, 8:45 am, and 9:10 am (one way).

3) June 21, Tuesday, 5:15 pm – 5:45 pm:

a) One coach from SU to DoubleTree (one drop only);

b) One coach from SU to Residence Inn and Hyatt Place (one drop only).

4) June 22, Wednesday, 7:30 am – 9:30 am:

a) one coach connecting DoubleTree and UNLV Student Union (first departs from DoubleTree) – departs from DoubleTree at 7:30 am, 7:45 am, 8:00 am, 8:15 am, 8:30 am, 8:45 am, 9:00 am, and 9:15 am (one way).

b) one coach connecting Residence Inn, Hyatt Place, and Student Union (first departs Residence Inn) – departs from Residence Inn at 7:30 am, 7:55 am, 8:20 am, 8:45 am, and 9:10 am (one way).

5) June 22, Wednesday, 6:30 pm – 7:30 pm:

a) One coach from SU to DoubleTree; departs SU at 6:30 pm, 6:45 pm, 7:00 pm, and 7:15 pm (one way).

b) One coach from SU to Residence Inn and Hyatt Place (one drop only) departs SU at 6:30 pm, 6:55 pm, and 7:20 pm (one way).

* Please note that this schedule is subject to change. Please check this page frequently for the latest information.