



# 2023 ASCE INTERNATIONAL CONFERENCE ON COMPUTING IN CIVIL ENGINEERING

JUNE 25-28, 2023

CORVALLIS, OR



**Oregon State University**  
College of Engineering



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# Welcome Message

Welcome to the 2023 ASCE International Computing in Civil Engineering (i3CE) Conference in Corvallis, Oregon! As in previous years, i3CE is the premier and flagship meeting of the ASCE Computing Division, where researchers from our community present the latest advances in computing applications for civil engineering. Our program includes five keynote talks by the recipients of various ASCE awards, three workshops, a poster session, and over 300 oral presentations, all of which promise to provide attendees with an exciting and enriching experience.

We would like to thank everyone involved in making 2023 ASCE i3CE conference a success. This includes the technical chairs, track chairs, reviewers, authors, workshop and poster session organizers, and student volunteers without whom this meeting would not be possible. We also thank Donna Williams, Carly Weber, and Mark Jacobson from OSU conference services, and the Alumni Center staff for organizing the conference logistics. Last but not least, we thank all of you for attending the 2023 ASCE i3CE conference and making it one of the top venues for computing in civil engineering research in the world.

OSU is home to an ever-expanding College of Engineering and to innovations such as the computer mouse, the Leatherman, and even 1968 gold medalist high jumper Dick Fosbury's "Fosbury Flop"! In the Valley Library you can visit the special archives of alumnus Linus Pauling, the only recipient of two unshared Nobel prizes. We hope that you take time to explore Corvallis, nestled at the foot of the coastal range in the bountiful Willamette Valley. Beyond OSU, we hope you have time to visit the outdoor attractions of our beautiful state, Oregon.

We hope you have a wonderful time in Corvallis!

Yelda Turkan, Conference Chair

On behalf of the 2023 ASCE i3CE Organizing Committee



# THINGS TO DO IN AND AROUND CORVALLIS

There is much to do in Corvallis, Oregon located in the Pacific Northwestern United States. In less than an hour, you can visit the spectacular Oregon Coast or go on an adventure in Central Oregon.

The City of Corvallis, Willamette Valley, Oregon, and the Pacific Northwest are full of attractions for visitors of all ages. We encourage you to spend extra days at your own convenience to visit the area.

- Corvallis, OR (<https://www.visitcorvallis.com/>)
- TravelOregon.com (<https://traveloregon.com/>)
- Oregon State University (<https://oregonstate.edu/>)
- Oregon State Parks (<https://stateparks.oregon.gov/>)
- Newport, OR
- Columbia River Gorge area
- National Parks (Oregon and Surrounding area)
  - Crater Lake
  - Mt. Hood
  - Mount St. Helens
  - John Day Fossil Beds
  - Lewis and Clark
- Tillamook Cheese
- Try Amtrak's very best Coast Starlight Train if you are looking for a train ride through the beautiful landscape in the Pacific Northwest



Many different breweries make their homes in or near Corvallis.

If you like wineries – go to the link (<https://www.visitcorvallis.com/wineries>) to explore all the award-winning wineries that Oregon has to offer!



# ORGANIZING COMMITTEE



Yelda Turkan (Conference Chair)  
Associate Professor  
School of Civil and Construction  
Engineering  
Oregon State University  
[yelda.turkan@oregonstate.edu](mailto:yelda.turkan@oregonstate.edu)



Joseph Louis (Conference Vice-Chair)  
Assistant Professor  
School of Civil and Construction  
Engineering  
Oregon State University  
[joseph.louis@oregonstate.edu](mailto:joseph.louis@oregonstate.edu)



Fernanda Leite (Technical Chair)  
Professor  
Department of Civil, Architectural  
and Environmental Engineering  
University of Texas at Austin  
[fernanda.leite@austin.utexas.edu](mailto:fernanda.leite@austin.utexas.edu)



Semiha Ergan (Technical Chair)  
Associate Professor  
Department of Civil and Urban  
Engineering  
New York University  
[semiha@nyu.edu](mailto:semiha@nyu.edu)



John Gambatese (Local Organizing  
Committee)  
Professor  
School of Civil and Construction  
Engineering  
Oregon State University  
[john.gambatese@oregonstate.edu](mailto:john.gambatese@oregonstate.edu)



Michael Olsen (Local Organizing  
Committee)  
Professor  
School of Civil and Construction  
Engineering  
Oregon State University  
[michael.olsen@oregonstate.edu](mailto:michael.olsen@oregonstate.edu)



Erzhuo "Ezra" Che (Local  
Organizing Committee)  
Research Assistant Professor  
School of Civil and Construction  
Engineering  
Oregon State University  
[erzhuo.che@oregonstate.edu](mailto:erzhuo.che@oregonstate.edu)

## **Reality Capture Technologies**

Mani Golparvar-Fard (University of Illinois at Urbana-Champaign)  
Kevin Han (North Carolina State University)

## **BIM, Ontologies and Semantic Approaches**

Tanyel Bulbul (Virginia Tech)  
Nora El-Gohary (University of Illinois at Urbana-Champaign)  
Farrokh Jazizadeh (Virginia Tech)  
Jiansong Zhang (Purdue University)

## **Visualization, Simulation and Process Modeling**

Aaron Costin (University of Florida)  
Thomas Czerniawski (Arizona State University)  
Eric Du (University of Florida)  
Youngjib Ham (Texas A&M University)  
Bing Han (University of Colorado at Denver)

## **Big Data and Machine Learning**

Fei Dai (West Virginia University)  
Kaijan Liu (Stevens Institute of Technology)  
Jong Won Ma (Concordia University)  
Zhengbo Zou (University of British Columbia)

## **Robotics, Automation and Control**

Reza Akhavian (San Diego State University)  
Yong Cho (Georgia Institute of Technology)  
Carol Menassa (University of Michigan)

## **Built Environment and Infrastructure Monitoring, Assessment, and Maintenance**

Qian Chen (University of British Columbia)  
Arsalan Heydarian (University of Virginia)  
Yongcheol Lee (Louisiana State University)  
Omobolanle Ogunseiju (Georgia Tech)

## **Computing for Resilient and Sustainable Urban Systems**

Ali Mostafavi (Texas A&M University)  
Chao Fan (Clemson University)  
Qingchun Li (Princeton University)  
Jin Zhu (University of Connecticut)

## **Integrated Human-Machine Intelligence**

Changbum Ahn (Seoul National University)  
Hubo Cai (Purdue University)  
Pingbo Tang (Carnegie Mellon University)  
Cheng Zhang (New York University)

## **Computing for Health and Safety**

Behzad Esmaili (Purdue University)  
Masoud Ghesari (University of Florida)  
Sogand Hasanzadeh (Purdue University)  
Chuma Nnaji (Texas A&M University)

## **Technology Enriched Engineering Pedagogy & Workforce Training**

Steven Ayer (Arizona State University)  
Renate Fruchter (Stanford University)  
Glenn Katz (Stanford University)

# AWARDEES AND KEYNOTE SPEAKERS



**Burcin Becerik-Gerber**

*Recipient of 2023 ASCE Computing in Civil Engineering Award*  
Award Speech: **Monday, June 26<sup>th</sup>, 8:15am**

Dr. Burcin Becerik-Gerber is the Chair and Dean's Professor of Civil and Environmental Engineering at the University of Southern California and a member of the National Academy of Construction. She has received numerous research and teaching awards including the NSF CAREER Award (2014). She serves as an Associate Editor for ASCE's Journal of Computing in Civil Engineering since 2011 and as an Editorial Board Member for Nature's Scientific Reports since 2021. Her research focuses on interactions between the built environment and its users and aims to understand and predict how and why humans interact with their built environment.



**Burcu Akinci**

*Recipient of 2023 ASCE Peurifoy Construction Research Award*  
Award Speech: **Monday, June 26<sup>th</sup>, 8:45am**

Dr. Burcu Akinci is the Paul Christiano Professor of Civil & Environmental Engineering at Carnegie Mellon University and a member of the National Academy of Construction. Dr. Akinci's research focuses on modeling and reasoning about information rich histories of buildings and infrastructure systems to streamline construction and infrastructure operations. She specifically focuses on integrating information models with data capture technologies such as 3D imaging and embedded sensors to create digital twins of construction projects and infrastructure operations to support proactive and predictive operations and management.



**Ali Mostafavi**

*Recipient of 2023 The Daniel W. Halpin Award for Scholarship in Construction*

Award Speech: **Monday, June 26<sup>th</sup>, 12:45pm**

Dr. Ali Mostafavi is the Zachry Career Development Associate Professor in the Zachry Department of Civil & Environmental Engineering at Texas A & M University. He has received several award and honors such as an Early-Career Research Fellowship from the National Academies' Gulf Research Program and a NSF CAREER Award. Dr. Mostafavi is a member of the ASCE Infrastructure Resilience Division and an Editorial Board member of the ASCE Management in Engineering Journal. Dr. Mostafavi also leads the UrbanResilience AI Lab, and his research focuses on analyzing, modeling, and improving network dynamics in the nexus of humans, disasters, and the built environment to foster convergence knowledge of resilient communities.





**Lucio Soibelman**

*Recipient of 2022 ASCE Peurifoy Construction Research Award*  
Award Speech: **Tuesday, June 27<sup>th</sup>, 8:15am**

Dr. Lucio Soibelman is the Fred Champion Estate Chair in Engineering and Professor of Civil and Environmental Engineering and Spatial Sciences Institute at the University of Southern California and a member of the National Academy of Construction. He has received numerous awards including the ASCE Computing in Civil Engineering Award, ASCE Construction Institute Construction Management Award, ASCE Richard R. Torrens Award and the NSF CAREER Award. His research focuses on advanced data acquisition, management, visualization, and mining for construction and operations of advanced infrastructure systems.



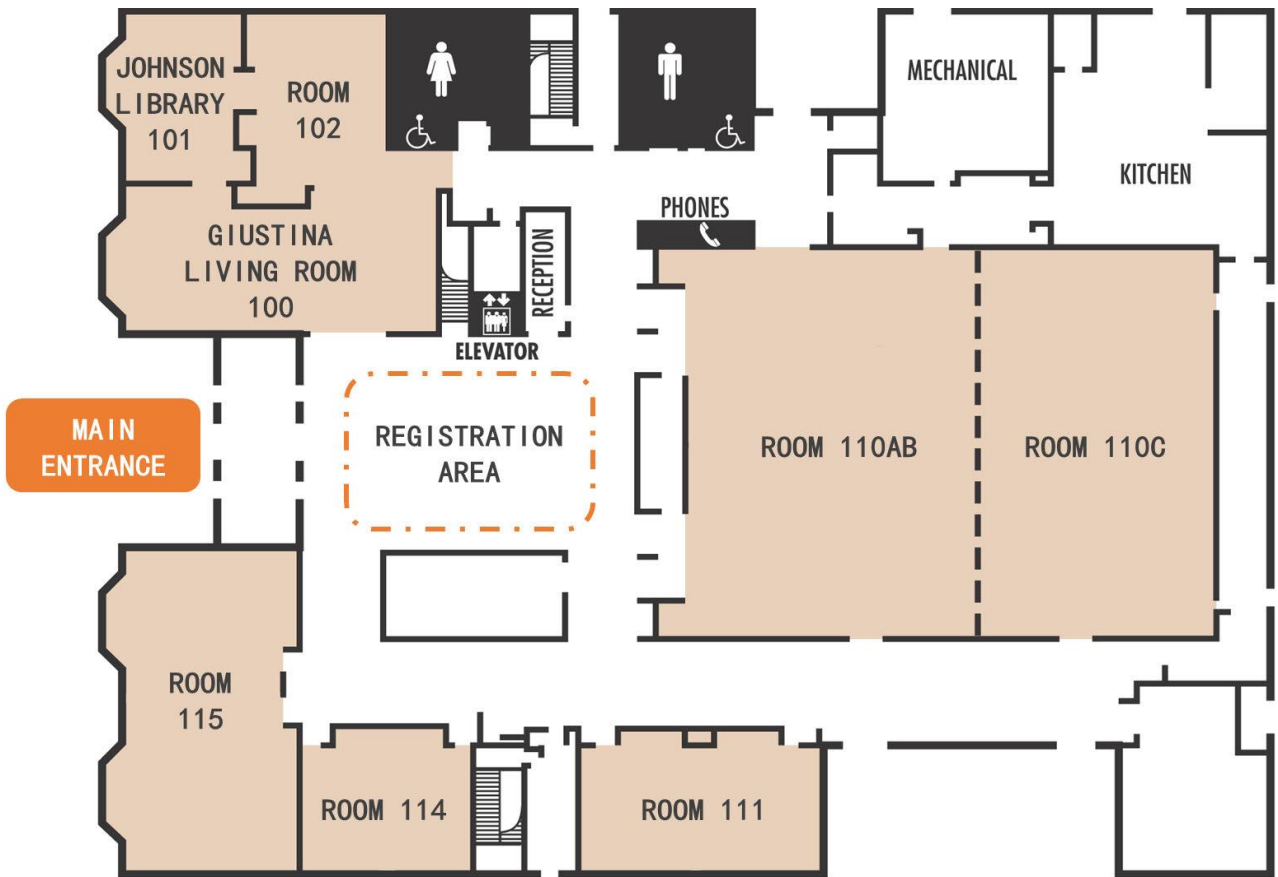
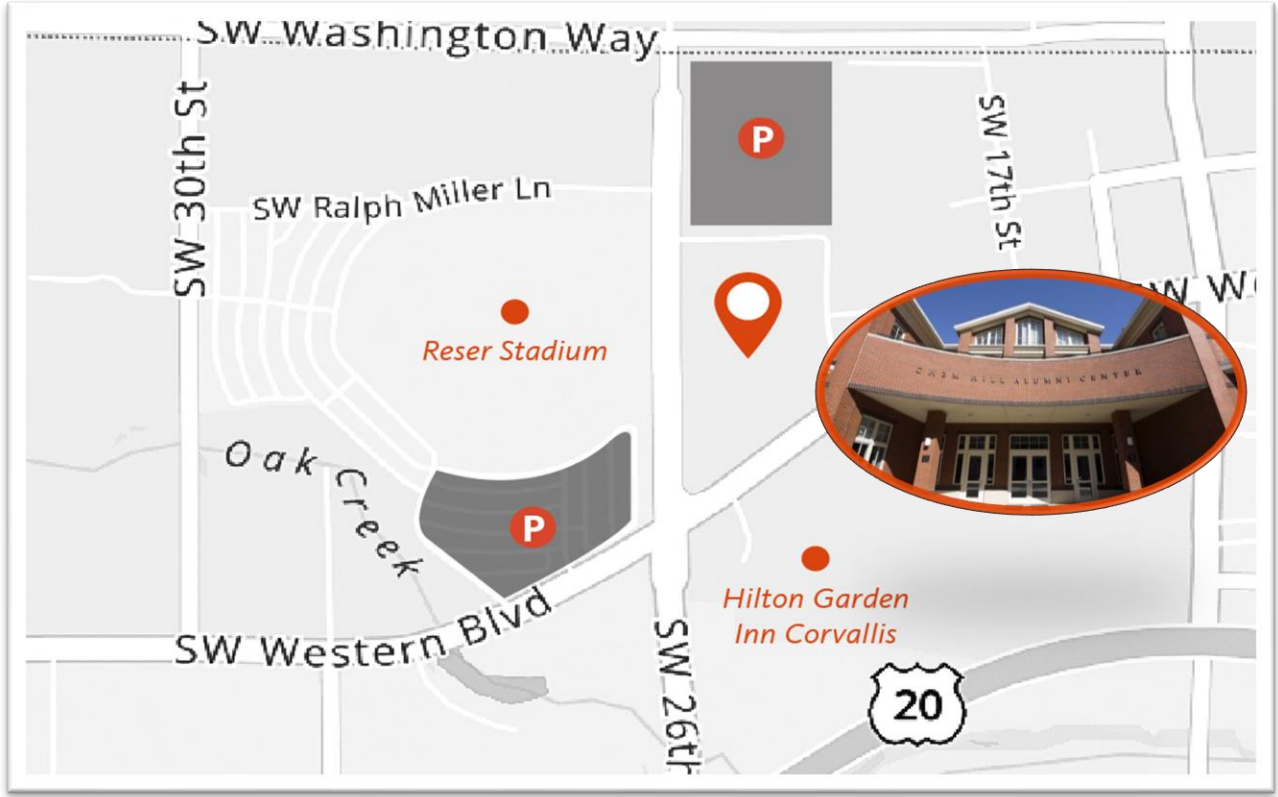
**John Messner**

*Recipient of 2022 ASCE Computing in Civil Engineering Award*  
Award Speech: **Tuesday, June 27<sup>th</sup>, 1:00pm**

Dr. John Messner is the Charles and Elinor Matts Professor of Architectural Engineering and the Computer Integrated Construction (CIC) Research Program Director at Penn State University. John specializes in Building Information Modeling (BIM), digital twins, and automation in construction research. Dr. Messner led several projects that developed BIM planning processes which are incorporated into the National BIM Standard - US. He is the Chair of the U.S. National BIM Standard Planning Committee, a BOD member of the Lean Construction Institute, a member of the National Academy of Construction, and a previous chair of the ASCE Computing Division.



# MAP AND LAYOUT OF CH2M HILL ALUMNI CENTER



	Sunday June 25, 2023	Monday June 26, 2023		
7:00	<p><b>Note:</b></p> <p>Meals, award speeches, and committee meetings will be held in Room 110ABC.</p>	7:00 - 8:00 <i>Breakfast</i>		
8:00		8:00 - 8:15 <i>Opening Remarks</i>		
9:00		8:15 - 8:45 <i>Computing Award Speech (2023)</i>		
10:00		8:45 - 9:15 <i>Peurifoy Award Speech (2023)</i>		
11:00		9:15 - 9:45 <i>Break</i>		
12:00		9:45 - 12:00 <i>Technical Sessions</i>	9:45 - 12:00 <i>EXCOM Meeting Room 203</i>	
1:00		12:30 - 2:30 <i>Workshop 1 Future Engineers, working with AI and Emerging Technology Room 110ABC</i>	12:00 - 1:30 <i>Lunch</i>	
2:00		2:30 - 3:00 <i>Break</i>	12:45 - 1:15 <i>Halpin Award Speech (2023)</i>	
3:00		3:00 - 5:00 <i>Workshop 2 Inclusive Workplaces Room 115</i>	1:30 - 2:00 <i>Break</i>	
4:00		3:00 - 5:00 <i>Workshop 3 AI in Work Packaging Room 110ABC</i>	2:00 - 5:10 <i>Technical Sessions</i>	2:00 - 5:10 <i>EXCOM Meeting Room 203</i>
5:00		5:00 - 8:00 <i>Welcome Reception Ph.D. Poster Session</i>	5:10 - 6:00 <i>Buses leave for Tye Winery</i>	
6:00			6:00 - 9:00 <i>Dinner at Tye Winery (<a href="https://www.tyewine.com/">https://www.tyewine.com/</a>)</i>	
7:00				
8:00				
9:00				

AM

PM

# SCHEDULE

**Tuesday**  
June 27, 2023

7:00 - 8:00 *Breakfast*

8:00 - 8:15 *COE Dean Ashford Remarks*

8:15 - 9:15 *Peurifoy Award Speech (2022)*

9:15 - 9:45 *Break*

9:45 - 12:00  
*Technical Sessions*

12:00 - 1:30 *Lunch*

12:45 - 1:00 *All Stakeholder Meeting*

1:00 - 1:30 *Computing Award Speech (2022)*

1:30 - 2:00 *Break*

2:00 - 4:15  
*Technical Sessions*

4:15 - 4:30 *Break*

4:30 - 5:30  
*VIMS Committee Meeting*

5:30 - 6:30  
*DSA Committee Meeting*

6:30 - 7:30  
*Education Committee Meeting*

6:30 - 7:30  
*KACEPMA Meeting*  
Room 115

7:30 - 8:30  
*Global Center Meeting*

**Wednesday**  
June 28, 2023

7:00 - 8:00 *Breakfast*

8:00 - 8:30 *ASCE Future World Vision*

8:30 - 9:00 *Daan Liang Remarks*

9:00 - 9:45 *Break*

9:45 - 12:00  
*Technical Sessions*

12:00-1:30 *Lunch*  
*Closing Remarks*

1:30 - 3:30 *NSF Workshop: Dr. Daan Liang, Humans, Disasters and the Built Environment (HDBE) Program Director*  
Room 115



# TECHNICAL SCHEDULE: Monday (6/26/23) 9:45-10:45AM

## TECHNICAL SESSION# 1: MONDAY (6/26/23) 9:45 - 10:45AM

1A: Building Information Modeling Room 114 Chair: Christopher Rausch	1B: Infrastructure Analysis and Maintenance Room 110AB Chair: Aslihan Karatas	1C: Safety Applications Room 111 Chair: Behzad Esmaili	1D: Intelligent Human-Machine Interaction Room 110C Chair: Changbum Ahn	1E: Artificial Intelligence Room 102 Chair: Yangming Shi	1F: Reality Capture Technologies Room 115 Chair: Jin Ouk Choi
4745: Automated geometry updating for digital twins in construction Christopher Rausch	8499: Towards a Domain-Agnostic Deep Learning-Based Scale Inference Approach in Construction Drawings Benedikt Faltin, Phillip Schönfelder and Markus König	5956: Construction Worker Workload Assessment for Human Human versus Human-Robot Collaboration in Wood Assembly C. Okonkwo, X. Liang, U. Rasheed, I. Awolusi, J. Cai and B. Wibranek	646: A Systematic Review of Speech Understanding Studies for Human-Robot Collaborative Construction Zirui Hong and Hubo Cai	822: Automated Bridge Inspection Image Interpretation Based on Vision-Language Pre-Training Shengyi Wang and Nora El-Gohary	1280: Sensor Fusion-based Point Clouds Registration Considering Safety Net During Scaffold Installation Juhyeon Kim, Jeehoon Kim, Sunwoong Paik and Hyoungkwan Kim
5891: Interactive Design by Integrating a Large Pre-Trained Language Model and Building Information Modeling Suhyung Jang and Ghang Lee	5866: Circular economy strategies for reducing embodied carbon in the us commercial building stocks: a system dynamics modeling approach Radwa Eissa and Islam El-Adaway	3350: Vision-based Ergonomic Risk Assessment of Back-Support Exoskeleton for Construction Workers in Material Handling Task Yizhi Liu, Amit Ojha and Houtan Jebelli	1643: A Deictic Gesture-Based Human-Robot Interface for In Situ Task Specification in Construction Sungboon Yoon, Jinsik Park, Moonseo Park and Changbum Ahn	5310: Using road design priors to improve large-scale 3D road scene segmentation Diana Davletshina and Ioannis Brilakis	4297: Synthetic Image Generation for Training 2D Segmentation Models at Scale for Computer Vision Progress Monitoring in Construction Juan D. Núñez-Morales, Shun-Hsiang Hsu and Mani Golparvar-Fard
3805: Optimal floor tile layout plan generation based on Building Information Modeling (BIM) Shashini Karunasena, Sangyoon Park, Sungha Ju and Joon Heo	7400: A Comparative Study of Human-Centered HVAC System Energy Optimization for Demand Response Mostafa Meimand and Farrokh Jazizadeh	4855: Assessing the Impact of Active Back Support Exoskeletons on Muscular Activity during Construction Tasks: Insights from Physiological Sensing Amit Ojha, Hongyu Guo, Houtan Jebelli, Anne Martin and Abiola Akanmu	2166: Joint BERT Model for Intent Classification and Slot Filling Analysis of Natural Language Instructions in Co-Robotic Field Construction Work Somin Park, Carol Menassa and Vineet Kamat	8069: Assessing Workers' Operational Postures via Egocentric Collaborative Camera Mapping Ziming Liu, Christine Wun Ki Suen, Zhengbo Zou, Meida Chen and Yangming Shi	4400: Lessons Learned from Developing a 3D Point Cloud Model of a Modular House by Photogrammetric Approach Preetam Kapsikar and Jin Ouk Choi
7090: Model-based Checklist Generation for Façade Safety Inspection Guidance Zhuoya Shi, Young Jun Lee and Semih Ergan	6511: A graph-based approach to minimize redundant spatial computations for automated construction safety prevention through design and planning Karsten W. Johansen, Carl Schultz and Jochen Teizer	9314: Potential of Adopting Occupational Exoskeletons in Construction: A Synergistic Perspective D. Mahmud, S. T. Bennett, Z. Zhu, P. G. Adamczyk, M. Wehner, D. Veeramani and F. Dai	7356: Worker's physiological/psychological responses during human-robot collaboration in an immersive virtual reality environment Chauhan and Ali Pakbaz	8657: Transformer-Based Semantic Segmentation for Recycling Materials in Construction Xin Wang, Wei Han, Sicheng Mo, Ting Cai, Yijing Gong, Yin Li and Zhenhua Zhu	4457: Automated Construction Progress Monitoring in Modular Construction Factories Using Computer Vision-based Instance Segmentation Roshan Panahi, Joseph Louis, Colby Swanson, Ankur Podder and Shanti Pless
5794: A novel AI-based digital twinning approach for automated BIM semantic enrichment and image-based 3D Reconstruction Tao Wang and Vincent Gan	2432: Adaptive Academic Buildings for Improving Comfort and Well-Being of College Students Using Artificial Intelligence of Things Min Jae Lee and Ruichuan Zhang	553: Cognitive Impact of Wearing Exoskeleton on Hazard Identification Performance of Construction Workers H. Seo, S. Pooladvand, A. Aslanli, S. Hasanzadeh and B. Esmaili	5097: Motion-based Control Interface for Intuitive and Efficient Teleoperation of Construction Robots Usman Rasheed, Xiaoyun Liang, Jiannan Cai, Shuai Li and Yuqing Hu	8726: 3D Urban Building Reconstruction Using Neural Rendering Technique Cheolhwan Kim, Jisang Lee, Wonjun Choi, Youngmok Kwon and Hong-Gyoo Sohn	1757: Detection, Tracking, and Segmentation of Transient Construction Objects in Video Frames Houhao Liang and Justin K.W. Yeoh

# TECHNICAL SCHEDULE: Monday (6/26/23) 11AM-12PM

## TECHNICAL SESSION#2: MONDAY (6/26/23) 11-12PM

2A: Building Information Modeling Room 114 Chair: Christopher Rausch	2B: Infrastructure Analysis and Maintenance Room 110AB Chair: Tanyel Bulbul	2C: Safety Applications Room 111 Chair: Houtan Jebelli	2D: Intelligent Human-Machine Interaction Room 110C Chair: Changbum Ahn	2E: Artificial Intelligence Room 102 Chair: Ivan Mutis	2F: Reality Capture Technologies Room 115 Chair: Kyubyung Kang
<b>2300: Conceptual Framework of Integrated Augmented Reality System on Screen for BIM-based Collaboration</b> Jin Gang Lee	<b>552: Insights from Applying Association Rule Mining to Pipeline Incident Report Data</b> Lemlem Asaye, Muhammad Ali Moriyani, Chau Le, Trung Le and Om Prakash Yadav	<b>362: Safety Immersive Storytelling Videos Using Virtual Humans and 360-degree Panoramas: A Pilot Study of Fall Hazard Training with Residential Construction Professionals</b> Josiane Isingizwe, Ricardo Eiris and Ahmed Al-Bayati	<b>5344: Context-Aware Deep Learning Model for 3D Human Motion Prediction in Human-Robot Collaborative Construction</b> Xiaoyun Liang, Lin Sheng, Jiannan Cai, Shuai Li and Yangming Shi	<b>3746: Feasibility Analysis on the Use of NLP-based Schedule Activity Analysis for 4D Project Planning and Controls</b> Yoonhwa Jung, Julia Hockenmaier and Mani Golparvar-Fard	<b>149: Comparing Bulk Volume Measurements between Surveying GPS and UAS-Mounted LIDAR</b> Andres Acero Molina, Yilei Huang and Zhen Zhu
<b>2972: Smart Construction Contract Generation Framework for Improved Decision-Making Processes</b> Erfan Moayyed and Eva Agapaki	<b>8114: Numerical analysis of cured-in-place pipe structural liner for underground pipeline rehabilitation</b> Junyi Duan, Chengcheng Tao and Ying Huang	<b>2151: Development of a Cost Effective Proximity Warning System for Fall Protection</b> Ziyu Jin and John Gambatese	<b>5533: VR Human Body Motion and Hand Gesture Control for ROV Teleoperation</b> Pengxia Xia, Hengxu You, Tianyu Zhou and Jing Du	<b>5199: Towards an Intelligent Automated Building Code Compliance System</b> Nishanth Purushotham, Chethan Kailashnath and Ivan Mutis	<b>4009: Stacked Object Detection with Adaptive Scanning and Density Centralized Voting</b> Hengxu You, Fang Xu and Jing Du
<b>3767: Streamlining Roof insulation panels Laying with Intelligent Technology: A Deep Learning and IFC-Based Approach for Material Identification and Verification Using OpenCV</b> Shaowen Han, Xiangyu Wang and Karsten Menzel	<b>1426: Information Visualization Platform for Underground Pipeline Maintenance Integrating BIM and GIS Data</b> Yiru Hou, Jae Heo and Soowon Chang	<b>4446: Emotional and Attitude Impacts of Drones on Construction Individuals Working at Heights</b> Gilles Albeaino, Idris Jeelani, Masoud Gheisari and Raja R. Issa	<b>6548: Haptic Augmentation System for Construction Robot Teleoperation</b> Tianyu Zhou, Pengxiang Xia, Yang Ye and Jing Du	<b>7206: Natural Language Processing (NLP)-driven Classification of Pre-Bid Request for Information (RFI) for Enhanced Bidding Process</b> R. Shrestha, T. Ko and J. Lee	<b>4213: A comparative feasibility study of using UAVs and laser scanning to determine the landfilled fly ash quantity</b> Muskan Sharma Kuinkel, Chengyi Zhang, Peng Liu and Khaled Ksaibati
<b>4220: Investigation of Data Exchange from BIM to VR: Compatibility Tests for Supporting Conversion Processes</b> Ha Kyun Ju, Jinwoong Lee, Sumedh Kharat, Soowon Chang and Kyubyung Kang	<b>3150: Automated Hydrogen Pipeline Cost Estimation Using GIS Technology</b> Chengyi Zhang, Zhichao Zhao, Huimin Li, Muskan Sharma Kuinkel and Selena Gerace	<b>5535: Evaluating the Impact of Powered Back-Support Exoskeletons and Virtual Reality Interventions on Gait Stability of Construction Workers at Heights</b> Shayan Shayesteh, Amit Ojha, Yizhi Liu and Houtan Jebelli	<b>8468: The Effect of Time Pressure on Human-Robot Interaction Performance during Excavator Teleoperation</b> Jin Sol Lee and Youngjib Ham	<b>1968: Enhancing Maintenance Management Effectiveness of Healthcare Facilities through Natural Language Processing</b> Yan Liu, Yongkui Li, Jiansong Zhang, Yi Jiang and Lingyan Cao	<b>6898: Heuristic optimization for digital twin modeling of existing bridges from point cloud data by parametric prototype models</b> M. Saeed Mafipour, Simon Vilgertshofer and André Borrmann
<b>841: Applications of Digital Twins for the Construction Process</b> Devayani Jahagirdar and Robert Leicht	<b>5566: A framework for assessing the building spatial design from fire evacuation perspective</b> Rong Fu, Ruizhe Kan, Hyungjoon Seo, Yong Yue and Cheng Zhang	<b>8672: Detecting and Preventing Falls Using a Hybrid Technology System: A Review</b> Solomon Ajasa and Siyuan Song	<b>3881: Trust in Construction AI-Powered Collaborative Robots: A Qualitative Empirical Analysis</b> Newsha Emaminejad and Reza Akhavian	<b>2306: Plan-View Wall Detection for Indoor Point Clouds using Weak Supervision</b> Chialing Wei and Thomas Czerniawski	<b>5542: Automatic Extraction of Curbs and Curb Ramps from Mobile Lidar Point Clouds</b> Erzhuo Che, Michael Olsen and Yelda Turkan

# TECHNICAL SCHEDULE: Monday (6/26/23) 2-3PM

TECHNICAL SESSION#3: MONDAY (6/26/23) 2-3PM					
3A: Building Information Modeling Room 114 Chair: Cheng Zhang	3B: Infrastructure Analysis and Maintenance Room 110AB Chair: Aslihan Karatas	3C: Safety Applications Room 111 Chair: Abbas Rashidi	3D: Robotics, Automation, and Control Room 110C Chair: Hyun Woo Lee	3E: Artificial Intelligence Room 102 Chair: Sogand Mohammadhasanzadeh	3F: Reality Capture Technologies Room 115 Chair: Reza Akhavian
<b>6783: Deep Reinforcement Learning for Structural Model Updating Using a Modifier Factor Approach</b> Kwok-Tai Pang, Yuqing Gao and Khalid Mosalam	<b>1735: Cloud-Enabled Indoor Thermal Comfort Assessment and Visualization Using Digital Twins, IoT, Robotics, and Indoor Positioning Technology</b> Xi Hu and Rayan H. Assaad	<b>4092: Analyzing the Impact Factors of Occupational Struck-by Fatality with the Random Forest Model</b> Peiyi Lyu, Siyuan Song and Solomon Ajasa	<b>4180: Design for Disassembly in the Construction Industry: Success Factors and Computing Tools</b> Guilherme Eliote, Fernanda Leite and Christopher Rausch	<b>6588: Generative Adversarial Network (GAN) based data augmentation for enhancing DL models on façade defect identification</b> Beyza Kiper, Savani Gokhale and Semiha Ergan	<b>6704: Automated Detection and 3D Reconstruction of Fire Hydrants using Different Sizes of Crop Functions and Software</b> Chi Tian, Kyubyung Kang, Yanchao Zheng, Kwonsik Song and Luciana Debs
<b>7004: Convex Polyhedra Intersection based Triangular Mesh Indexing Approach for BIM-to-Point-Cloud Change Detection</b> Sangyoon Park, Sungha Ju, Sanghyun Yoon, Hieu Nguyen and Joon Heo	<b>5085: Cost-Effective, Multipoint and User-Friendly Temperature Control System for Environmental Chambers</b> Jildardo Luna, Hevar Palani and Aslihan Karatas	<b>5543: Pedestrian phone-related distracted behavior classification in front-facing vehicle cameras for road user safety</b> Chih-Shen Cheng, Yalong Pi, Tim Lomax, Nick Duffield and Amir Behzadan	<b>1377: Analyzing modularity in construction digital twins for developing a dynamic modular reference architecture</b> Simon Kosse, Philipp Hagedorn and Markus König	<b>6984: Inhibitory Control Behavior of Novice and Experienced Drivers during Work zone Intrusion: Functional connectivity analysis using fNIRS</b> Shiva Pooladvand, Hrishikesh Pokharkar, Kyeongsuk Lee and Sogand Hasanzadeh	<b>518: Reality Capture Technologies for Automated Quality Control during Construction 3D Printing</b> Michael Martin, Kasra Banijamali and Ali Kazemian
<b>8315: Native Interaction with Building Information Models Using Artificial Intelligence</b> Armin Nabavi, Issa Ramaji and Naimeh Sadeghi	<b>7599: Personalized thermal comfort model for a multiple occupancy office building</b> Raviteja Patchava and JeeHee Lee	<b>5649: A Machine Learning-based Safety Assessment Framework for Roadway Construction Projects in Flood-prone Regions</b> Moeid Shariatfar and Yong-Cheol Lee	<b>1838: What Critical Design Features Matter to the Effectiveness of VR Workforce Training: Battery Rack Assembly and Connection</b> Xiaohui Wang, John Messner, Robert Leicht and Andrew Mackey	<b>9821: Exploration of Latent Themes in Truck-Mounted Attenuator (TMA) Related Accidents using Natural Language Processing</b> Chi Tian, Hongyue Wu, Yunfeng Chen, Jiansong Zhang and Yiheng Feng	<b>2533: Investigating personal environmental conditions for a wheelchair user to identify the disability-related inequity by building design and maintenance</b> J. Soni, S. McCullough and J. Young Park
<b>8851: LCA calculation of retrofitting scenarios using geometric model reconstruction and semantic enrichment of point clouds</b> Kasimir Forth, Florian Noichl and André Borrmann	<b>7881: Impacts of air cavities on hygrothermal performance of retrofitted timber frame assemblies in six US climates</b> Carolina Recart, Carrie Sturts Dossick and Tomas Mendez Echenagucia	<b>6058: Comparing Performance of Different Machine Learning Methods for Predicting Severity of Construction Work zone Crashes</b> Ali Hassandokht Mashhadi, Abbas Rashidi, Juan Medina and Nikola Marković	<b>5368: Self-driven optimization of robot design for ceiling systems</b> Kangkang Duan and Zhengbo Zou	<b>3933: Assessing the Impact of Construction Work Zone Layout on Traffic Safety: A Driving Simulator Experiment</b> Peng Liu, Chengyi Zhang, Qin Zhu, Huijin Li and Francois Jacobs	<b>4082: Target Domain Training Data Generation by Moving Object Detection and Label Propagation</b> Taegeon Kim, Giwon Shin, Seokhwan Kim, Vijayan Asari and Hongjo Kim
<b>5569: Development of a Parametric Modeling Method for Masonry Wall Systems to Support Robotic Construction</b> Austin McClymonds, Somayeh Asadi and Robert Leicht		<b>6830: Identifying High-risk Workers' Actions Contributing to Highway Construction Accidents</b> Thin Nguyen, Quan Do, Tuyen Le and Chau Le	<b>4331: Machine-Learning-Based Generative Design Optimization of the Energy Efficiency of Florida Single-Family Houses</b> Rita Elias and Raja R. A. Issa	<b>3932: Trends and Potentials in Design Optimization for Road Projects</b> Ke Dai and Jung In Kim	<b>7011: Robust Activity Recognition for Adaptive Worker-Robot Interaction using Transfer Learning</b> Farid Shahnava, Riley Tavassoli and Reza Akhavian



# TECHNICAL SCHEDULE: Monday (6/26/23) 3:15-4:15PM

TECHNICAL SESSION#4: MONDAY (6/26/23) 3:15-4:15PM					
4A: Building Information Modeling Room 114 Chair: Baris Salman	4B: Infrastructure Analysis and Maintenance Room 110AB Chair: Amirhosein Jafari	4C: Safety Applications Room 111 Chair: Ricardo Eiris	4D: Robotics, Automation, and Control Room 110C Chair: Abiola Akanmu	4E: Resilience and Sustainability Room 102 Chair: Kaijian Liu	4F: Reality Capture Technologies Room 115 Chair: Youngjib Ham
<p><b>933: Investigation of Digital Twin in the Perspective Construction Industry: Based on Literature Review</b> Sanjeev Adhikari and Tran Duong Nguyen</p>	<p><b>8823: Residential structural damage detection from wildfires using deep learning to analyze uncrewed aerial system (UAS) imagery</b> Daekun Kang, Michael J. Olsen and Erica Fischer</p>	<p><b>7813: Creating a Construction Safety VR Game with Decision-making Scenarios for an Interactive Learning Experience</b> Krishna Kisi, Omar Snosi and Vatsalya Sharma</p>	<p><b>1834: Automatic Pixel-Level Steel Structural Elements Detection Using U-Net</b> Zhouqian Jiang and John Messner</p>	<p><b>9658: Urban digital twin based decision support for housing rebuilding choices in catastrophically flooded communities</b> Holly Josephs, Yifan Wang, Jiahao Xia and Jie Gong</p>	<p><b>3755: Visual data-driven digital twin modeling framework for improving the resilience of urban drainage infrastructure systems</b> Jaeyoon Kim, Aswin Jacob Thomas and Youngjib Ham</p>
<p><b>2854: State-of-the-Practice of Digital Twin Implementation in the Utility Sector</b> Kolade Arisekola, Katherine Madson and Roy Sturgill</p>	<p><b>3791: 3D Machine Vision for Structural Element and Damage Identification</b> Molan Zhang, Katrina Montes, Jiaming Liu, Lama Hajmoussa, Ji Dang and Zhiqiang Chen</p>	<p><b>1094: Machine Learning at work? The issue of data quality when developing new insights in occupational accidents</b> May Shayboun, Christian Koch and Dimosthenis Kifokeris</p>	<p><b>2754: Vision-based Control of Construction Robot using Transfer Learning Approach</b> Srijeet Halder, Harshitha Gandra and Kereshmeh Afsari</p>	<p><b>2639: Autonomous UAV-based structural damage exploration platform for post-disaster reconnaissance</b> Xin Peng, Gaofeng Su, Benjamin Folk, Zhiqiang Chen and Raja Sengupta</p>	<p><b>9055: Indoor Navigation Systems via Augmented Reality and Reality Capture: From Allocentric to Egocentric Spatial Perspective</b> Fang Xu, Jason Moats, Joseph Gabbard and Jing Du</p>
<p><b>5958: Developing Digital Twin Data Structures and Integrated Cloud Architecture for Roads</b> Weiwei Chen and Ioannis Brilakis</p>	<p><b>7175: Recognition of Pavement Structural Damage Based on Nondestructive Testing and Computer Vision</b> Xiaogang Guo and Ning Wang</p>	<p><b>1761: Computer vision-based automatic emergency notification system: Interpreting construction workers' hand gestures</b> Ahmed Bin Kabir Rabbi and Idris Jeelani</p>	<p><b>4501: Exploration of Indoor Navigation Technologies and Development of a Prototype Application</b> Sushmit Sharma Bhattarai and Krishna Kisi</p>	<p><b>5708: Social Media Data Mining of Stakeholder Value Systems on Community Resilience in Florida</b> Hang Ren, Lu Zhang, Arif Sadri, N. Emel Ganapati and Travis Whetsell</p>	<p><b>9307: Schedule-driven analytics of 3D point clouds for automated construction progress monitoring</b> Aritra Pal, Jacob Je-Chian Lin and Shang-Hsien Hsieh</p>
<p><b>3008: Digital twin framework for railway bridges</b> Amirali Najafi, Baris Salman, Parisa Sanaei, Erick Lojano-Quispe, Zaid Amir, Ali Maher and Richard Schaefer</p>	<p><b>3015: Structural failure mode prediction in laterally loaded reinforced concrete columns using machine learning</b> Divine Agbobli, Jack Osei and Yunjeong Mo</p>	<p><b>2612: Development of a Sensor-Based Safety Performance Analytic Mobile System to Detect, Alert, Analyze and Modify Workers' Unsafe Behaviors</b> Hanjing Zhu and Bon-Gang Hwang</p>	<p><b>1940: Learning multi-granularity task primitives from construction videos for human-robot collaboration</b> Zaolin Pan and Yantao Yu</p>	<p><b>5726: Human-Sensitive Quantification of City-Scale Human Activity Changes during Natural Disasters</b> Yang Liu and Kaijian Liu</p>	<p><b>4753: Identifying CCTV Surveillance Coverage Using MMS Acquired Point Cloud and CCTV Images</b> Wonjun Choi, Youngmok Kwon, Jisang Lee, Cheolhwan Kim and Hong-Gyoo Sohn</p>
<p><b>318: Key Factors Affecting the Steel Construction Projects' Performance by Adopting Building Information Modeling (BIM) in Egypt</b> Shorouk M. Soliman, Hosam Mostafa Hegazy, Jiansong Zhang, Ibrahim M. Mahdi, Abdelrahim Khalil Dessouki and Ibrahim Abdel Rashid</p>	<p><b>9453: Application of LinkedIn data and Image processing to analyze construction career paths: Does race matter?</b> Abdolmajid Erfani and Qingbin Cui</p>	<p><b>6613: Towards an Efficient Physiological-based Worker Health Monitoring System in Construction: An Adaptive Filtering Method for Removing Motion Artifacts in Physiological Signals of Workers</b> Y. Liu, Y. Gautam, S. Shayesteh, H. Jebelli and M. Mahdi Khalili</p>	<p><b>1001: ICON-Pose: A Construction Worker Pose Estimation Dataset for Intelligent Construction</b> Christine Wun Ki Suen, Ziming Liu, Yangming Shi and Zhengbo Zou</p>	<p><b>5942: A spatial-temporal community vulnerability assessment based on human mobility trajectory simulation</b> Chen Xia, Yuqing Hu, Jianli Chen and Haiyan Hao</p>	<p><b>9693: Comparison of 3D reconstruction between Neural Radiance Fields and Structure-from-Motion based Photogrammetry from 360 videos</b> Mohit Gupta, Andre Borrmann and Thomas Czerniawski</p>

# TECHNICAL SCHEDULE: Monday (6/26/23) 4:30-5:10PM

## TECHNICAL SESSION#5: MONDAY (6/26/23) 4:30-5:10PM

5A: Artificial Intelligence Room 114 Chair: Thomas Czerniawski	5B: Infrastructure Analysis and Maintenance Room 110AB Chair: Hyun Woo Lee	5C: Safety Applications Room 111 Chair: Sogand Mohammadhasanzadeh	5D: Robotics, Automation, and Control Room 110C Chair: Kevin Han	5E: Resilience and Sustainability Room 102 Chair: Michael Olsen	5F: Visualization and Simulation Room 115 Chair: Hongtao Dang
9052: Potential of Vision-based 6-DoF Pose Estimation for Cuboid-shape Objects from Construction Jobsites Quan Miao and Meiyin Liu	1267: Forecasting Construction Labor Productivity Metrics Emil L. Jacobsen, Søren Wandahl and Jochen Teizer	6409: Digital Twin-Based Health Maps for Construction Worker Health Monitoring: Assessing Feasibility and Viability Shayan Shayesteh, Houtan Jebelli and John Messner	246: An Autonomous Robotic Sensing System for Intelligent Inspection of Indoor Building Systems Yining Wen, Kaiwen Chen and Nilay R. Choudhury	4965: GIS-enabled Resilience Strategies for Post-Disaster Reconstruction: a case study of Pakistan D. Kumar, C. Zhang, M. Kamran and S. Demirkesen Cakir	492: Emerging Technologies in Interactive Workspaces: A Framework for Architecture, Engineering, and Construction Use Cases N. Akindele and J. Lather
9626: Dependency Parsing-based Information Extraction from Car Crash Narratives to Support Crash Scene Reconstruction Hang Li, Jiansong Zhang, Yunfeng Chen, Yiheng Feng and Robert Proctor	6428: Agent-based modeling for understanding incentives associated with distributed solar generation Gasser Ali and Islam El-Adaway	2861: Hashing-based Object Tracking for Construction Site Safety Monitoring across Different Domains Wei-Chih Chern, Vijayan Asari and Hongjo Kim	254: An Integrated UGV System for Automated Welding on Construction Site Doyun Lee and Kevin Han	6100: Using Machine Learning and Aggregated Remote Sensing Data for Wildfire Occurrence Prediction and Feature Selection: A Case Study in California Timothy Gao, Lufan Wang and Xiang Gao	2692: Metaverse for AEC: A SWOT Analysis Ahmad Hadavi and Sepehr Alizadehsalehi
9199: Implementing Convolution Neural Network (CNN) based approach for Traffic Queue Length and Delay Estimation at Highway Ramps Sushant Tiwari, Abbas Rashidi and Nikola Markovic	4850: Autonomous Defect Inspection and Mapping for Building Maintenance Patrick Herbers, Firdes Celik and Markus König	5347: Computer Vision-based Monitoring of Construction Site Housekeeping Zherui Shao, Yang Miang Goh, Jing Tian, Yu Guang Lim and Vincent Gan Jie Long	1274: Integration of Autonomous Robotics, Indoor Localization Technologies, and IoT Sensing for Real-Time Cloud-Based Indoor Air Quality Monitoring and Visualization Xi Hu and Rayan H. Assaad	3553: Rapid and automated vision-based post-disaster building debris estimation Chih-Shen Cheng, Amir Behzadan and Arash Noshadravan	9066: Mixed Reality Workflow for Deconstruction Cutting and Packing Planning Gabriel Earle, Emmanouil Katsimpalis and Carl Haas

# TECHNICAL SCHEDULE: Tuesday (6/27/23) 9:45-10:45AM

TECHNICAL SESSION#6: TUESDAY (6/27/23) 9:45 - 10:45AM					
6A: Building Information Modeling Room 114 Chair: Kaijian Liu	6B: Infrastructure Analysis and Maintenance Room 110AB Chair: Yunjeong Mo	6C: Computing for Education Room 111 Chair: Ivan Mutis	6D: Intelligent Human-Machine Interaction Room 110C Chair: Hubo Cai	6E: Resilience and Sustainability Room 102 Chair: Sagata Bhawani	6F: Visualization and Simulation Room 115 Chair: Reza Akhavian
<b>1836: Automated Relation Extraction for Improved Generalizability across Different Types of Text</b> Qiyang Chen and Nora El-Gohary	<b>2245: UAS-based Infrastructure Inspection Path Planning Considering Visual Recognition Performance</b> Yuxiang Zhao, Binyao Guo, Ishfaq Aziz and Mohamad Alipour	<b>9132: Predicting high-impact research in the construction engineering and management domain using computational machine learning</b> I. El-Adaway, G. Ali, M. Ahmed, R. Eissa, M. Abdul Nabi, T. Elbashbishy and R. Khalef	<b>2354: Uncovering Potential Collusive Behavior of AI Bidders in Future Construction Bidding Market</b> Chan Heo, Changbum Ahn and Moonseo Park	<b>1917: Enhancing Sustainability in the Built Environment Through Digital Technologies: Case Study of a Construction Firm</b> Paige Rice, Yewande Abraham and Sagata Bhawani	<b>4365: Virtual Reality Safety Training Assessment in Construction Management and Safety and Health Management Programs</b> Hongtao Dang, Jennifer Serne and Mohammadsoroush Tafazzoli
<b>1958: Digital Twin for Built Assets enabling Sustainability Tracker</b> Jaehyun Park	<b>2995: Resources Based Planning Framework for Infrastructure Maintenance &amp; Rehabilitation Projects</b> Heba Kh. Gad, Ossama Hosny and Khaled Nassar	<b>2294: LivingBIM: As-designed and As-built Dataset for an Academic Building including BIM models, Point Clouds, and 360 Images.</b> A. Alsuhaibani, J. Rojas, C. Leffel, J. Won Ma and F. Leite	<b>3251: Trust in Human-AI Interaction: Review of Empirical Research on Trust in AI-powered Smart Home Ecosystems</b> Tianzhi He and Farrokh Jazizadeh	<b>6149: An Interpretable Machine Learning Method to Inform Urban Adaptation to Heatwaves</b> Tong Liu and Chao Fan	<b>5156: Collaborative Virtual Training with Embodied Physics and Haptic Feedback: Construction Material Handling as an Example</b> Yang Ye, Fang Xu and Jing Du
<b>1891: IFC-based Stormwater Drainage Modeling to Support BIM for Infrastructure</b> Hang Li, Xiaorui Xue, Jiansong Zhang and Yunfeng Chen	<b>3506: Estimating Output Variance of a Regressing Tree Model: Case Study of Concrete Strength Prediction</b> Monjurul Hasan and Ming Lu	<b>9401: Knowledge Sharing and Workforce Engagement Using Digital Twins-Based Simulations and Virtual Reality for Process Operations</b> Pengkun Liu, Jinding Xing, Yuanhao Li, Christopher Miller and Pingbo Tang	<b>5754: Understanding of risky determinants affecting the success of design build airport projects using computational clustering techniques</b> Ramy Khalef and Islam El-Adaway	<b>4735: BIM as a Mitigation Tool for COVID-19 Management on a University Campus</b> Don Chen, Turner Cash, Milad Rogha, Wenwu Tang, Cynthia Gibas and Mariya Munir	<b>5506: Development of a VR Training Platform for Active Shooter Incident Preparedness in Healthcare Environments via a Stakeholder-Engaged Process</b> Ruying Liu, Burcin Becerik-Gerber, Gale Lucas and Kelly Busta
<b>2100: Trends and Opportunities for Material Information Sharing Using BIM to Achieve Supply Chain Integration</b> Seogjae Choi and Fernanda Leite	<b>6418: A Convolutional Autoencoder Framework for Probabilistic Anomaly Detection on Infrastructure Systems</b> Yueyan Gu and Farrokh Jazizadeh	<b>4155: Transfer Learning-based Question Generation for Building a Construction Safety Chatbot</b> Ning Wang and Raja R. A. Issa	<b>4773: Development of a Blockchain Prototype for Collaborative Risk Assessment of Construction Projects</b> In Bae Chung and Carlos Caldas	<b>9952: Assessing the Vulnerability of Communities Exposed to Climate Change-Related Challenges Caused by the Urban Heat Island Effect Using Machine Learning</b> G. Assaf and R. H. Assaad	<b>6027: Virtual Environment for Studying the Effects of Operational and Environmental Sounds on Teleoperated Demolition</b> P. B. Rodrigues, B. Becerik-Gerber, L. Soibelman, G. M. Lucas and S. C. Roll
	<b>7311: Multi-class 3D tunnel point cloud segmentation using a deep learning method</b> Ankang Ji and Hongqin Fan		<b>4224: Optimizing Adaptive Signalized Intersections: A Cooperative Game Theory Approach</b> Kholoud Kotb, Mohamed S. Eid and Ahmed Osama	<b>3257: Revving Up the Grid: The Potential of Vehicle-to-Grid Technology</b> Adrian Petrisor and Atefeh Mohammadpour	<b>5984: Launching Successful Datathons: Lessons Learned from Recent ASCE VIMS Datathons</b> Semiha Ergan, Fei Dai, Eric Du and Reza Akhavian



# TECHNICAL SCHEDULE: Tuesday (6/27/23) 11AM-12PM

TECHNICAL SESSION#7: TUESDAY (6/27/23) 11-12PM					
7A: Building Information Modeling Room 114 Chair: Tanyel Bulbul	7B: Infrastructure Analysis and Maintenance Room 110AB Chair: Rishree Jain	7C: Computing for Education Room 111 Chair: Anne Anderson	7D: Intelligent Human-Machine Interaction Room 110C Chair: Pingbo Tang	7E: Resilience and Sustainability Room 102 Chair: Michael Olsen	7F: Visualization and Simulation Room 115 Chair: Bing Han
<b>7456: Decision-making framework for implementing blockchain in building operations and maintenance (O&amp;M)</b> Dimosthenis Kifokeris, Algan Tezel and Sungkon Moon	<b>8256: Investigating the Trends in the Adoption and Implementation of Sustainable Building Rating Systems: A Critical Analysis of the LEED Rating System</b> P. Gupta, Y. Abraham and B. G. Celik	<b>2618: Workforce-Related Challenges of Construction 4.0 Technologies in the Architectural, Engineering, and Construction Industry</b> Elnaz Safapour and Anupa Silwal	<b>487: Safe Human-Drone Interaction in Construction: Exploring Gesture and Speech Communication Modalities</b> Zixian Zhu, Jiun-Yao Cheng, Idris Jeelani and Masoud Gheisari	<b>4546: Does the ADA work? A social media data driven investigation for disability-related inequity at airports</b> Steven McCullough, Ariana Grant, Jhanvi Soni, Evan Mistur and June Young Park	<b>8343: VR-based Safety Training Program for General &amp; Enabling Works in Construction Projects.</b> Sahar Badr, Ossama Hosny and Ibrahim Abotaleb
<b>7541: BIM and Blockchain-based Automatic Asset Tracking in Digital Twin for Modular Construction</b> Yaxian Dong, Yuqing Hu, Shuai Li, Jiannan Cai and Zhu Han	<b>9998: Investigation of The Importance of Residential Energy End Use in Normal Days and Natural Disasters</b> Biao Kuang, Tolulope Sanni, Yangming Shi, Mingxi Liu, Wanyun Shao and Jianli Chen	<b>3201: Introducing Computing to Construction Management Undergraduate Students Through Automated Quantity Takeoff from IFC-based BIM</b> F. Yang, J. Zhang, O. Wong Chong and C. Sexton	<b>1222: Investigating the Cognition-Control Pattern of Multi-Worker Human-Robot Collaboration in Construction</b> Di Liu and Youngjib Ham	<b>4491: American Time-Use Survey in Modeling Occupant Behavior: A Systematic Review</b> Sorena Vosoughkhosravi and Amirhosein Jafari	<b>713: Assessment and visualization of interactions between project stakeholders in a group decision environment</b> Ekin Eray, Carl T. Haas and Derek Rayside
<b>5816: Simulation modeling efforts in the construction industry: Integrated application of BIM and agent-based modeling</b> Kyudong Kim, Kasey M. Faust and Fernanda Leite	<b>6336: Exploring the Empirical Relationship Between Urban Form and Building Energy Use</b> Chi On Ho, Marco Miotti and Rishree Jain	<b>3416: Building Information Modeling Courses around Construction Programs</b> Hongtao Dang, Sanjeev Adhikari and Anne Anderson	<b>2278: Multi-task Deep Learning-based Human Intention Prediction for Human-Robot Collaborative Assembly</b> Jiannan Cai, Xiaoyun Liang, Bastian Wibranek and Yuanxiang Guo	<b>189: Leveraging Immersive Virtual Environments for Occupant Wellbeing Analysis</b> B. Altaf, A. Tavakoli, E. Bianchi, J. A. Landay and S. L. Billington	<b>3413: Risk-reward allocation among integrated project delivery method stakeholders: a gamified cooperative data simulation approach</b> R. Eissa, M. A. Nabi and I. El-Adaway
<b>1802: BIM and knowledge graph-based building material recycle and reuse assessment framework</b> Zheng Lu, Chuting Sun, Yuqing Hu and Akhil Kumar	<b>2517: The Impact of Affordable Home Features on Energy Burden in Low-Income Households in the U.S.</b> Shaya Sheikh, Ehsan Kamel and Amirhosein Jafari	<b>4949: Practitioners' and Instructors' Considerations in Workforce Development Collaborations: Inputs for Graphical User Interface of a Technology-driven Matching Platform</b> A. Yusuf, A. Akanmu, A. Ofori-Boadu, H. Murzi and S. Ball	<b>8675: Safe Robot Planning in Dynamic Construction Environments using Reinforcement Learning</b> Yeseul Kim, Andrew Yarvoiv, Yong Han Ahn and Yong K. Cho	<b>6186: Using Computer Vision and Parametric Design Software to Quantify Nature Dose in Indoor Built Environments</b> Eva Bianchi, Sarah Billington and Arash Tavakoli	<b>5271: Simulating Structural Motions of Floating Cities in an Immersive Virtual Reality Environment</b> Shengzhe Wang and Bing Han
<b>1799: Con-Metaverse: Its Potentiality, Challenges, and Possible Applications through NLP and Review</b> Jisoo Park, Chaeyoen Yu, Youjin Jang and Sungjin Kim	<b>9202: Developing a Transportation Asset Lifecycle Data Ecosystem: A Framework of Information Requirements and Flow</b> A. Ammar, G. Dadi and H. Nassereddine	<b>7596: Augmented Reality (AR) and Virtual Reality (VR) in Construction Education: A Systematic Literature Review</b> Andrew Kline and Steven Ayer	<b>1813: Bridge Inspection Strategies Analysis through Human-Drone Interaction Games</b> Pengkun Liu, Bowen Sun, Yanyu Wang and Pingbo Tang	<b>4030: Mixed reality promoting circular economy in urban water systems</b> Yu-Chen Lee and Fernanda Leite	<b>5873: Implementation Analysis of a Simulation-Aided Redesigned Emergency Department Before and After the Emergence of COVID-19</b> G. Abdolhazadeh, Y. Ahmadi and J. Lather

# TECHNICAL SCHEDULE: Tuesday (6/27/23) 2-3PM

TECHNICAL SESSION#8: TUESDAY (6/27/23) 2-3PM					
8A: Building Information Modeling Room 114 Chair: Jiannan Cai	8B: Infrastructure Analysis and Maintenance Room 110AB Chair: Amirhosein Jafari	8C: Safety Applications Room 111 Chair: Jee Park	8D: Robotics, Automation, and Control Room 110C Chair: Kevin Han	8E: Resilience and Sustainability Room 102 Chair: Erzhuo Che	8F: Visualization and Simulation Room 115 Chair: Renate Fruchter
6672: Deep learning method to detect and locate signages from 2D drawings for semantic enrichment of BIM Tianle Duan, Thi Qui Nguyen and Justin K.W. Yeoh	9257: Developing Data-Driven Occupancy Detection Models Based on Individual Plug Load Profiles in Office Spaces Sorena Vosoughkhosravi, Amirhosein Jafari and Madeline Thomas	883: VR-based Safety Training Program for in High-rise Construction Integrating Kolb's Learning Model and the Behaviorist Learning Theory Sahar Badr, Ossama Hosny and Ibrahim Abotaleb	200: Automated Building Assembly: Developments Toward Automated Building Machines Elizabeth Andrzejewski, Esther Obonyo and Marcus Shaffer	4694: Investigating the Data Inputs and Requirements for Response and Recovery Decision Models in Flooding Events S. Yasaman Ahmadi, Jennifer Lather, Christine Wittich and Katherine Madson	3380: An Integrated Urban Road Rehabilitation Planning and Decision Support Based on BIM and GIS Sining Li, Wonho Suh and Jung In Kim
6462: Investigation of the Costs and Benefits of Digital Twins in Construction Christian Abugu, Chimay Anumba and Kofi Asare	5036: Optimizing HVAC Systems for Energy Efficiency and Comfort: A Scalable and Robust Multi-Zone Control Approach with Uncertainty Considerations R. Xiong, H. Jing, M. Li, Y. Shi, T. Miki, T. Hatanaka, Y. Nakahira and P. Tang	9743: A Generic Safety and Efficiency-Oriented Platform for Managing Equipment Operations on Construction Sites Ali Khodabandelu, Jeewoong Park, Unmesa Ray and Cristian Arteaga	788: Guideline for Automated Construction of Reinforced Concrete Beams Using 3D Printing and BIM Ammar Alzarad, Siyuan Song, Muhammad Hatamleh, Ibukun Awolusi and Sudipta Chowdhury	6253: Impacts of Flooding on Traffic Functionality from Crowdsourced Location Data Francisco Contreras and Cristina Torres-Machi	3930: Operational Digital Twins: Definition and Common Use Cases Zahra Ghorbani, Madeline Cramer and John Messner
6593: A Digital Twin Platform Based on 3D Building Models and Smart IoT for A Climate-Resilient Campus: A Case Study of National Taiwan University Kuan-Chun Chen, Yun-Tsui Chang and Shang-Hsien Hsieh	9725: Understanding Impact of Sensing Flexibility and Strategies on HVAC Energy Consumption Modeling Nidia Bucarelli and Nora El-Gohary	9782: Insights from Applying Association Rule Mining to Construction Severe Injury Reports Chau Le, Giridhari Doddi, Muhammad Ali Moriyani and Tuyen Le	2847: Constructability Assessment for Robotics in Construction Ziyi Wang, Yuqing Hu and Robert Leicht	8920: Measuring Disparity in Flood Risk and Freeboard Benefits for Different Income Groups Anisha Deria, Rubayet Bin Mostafiz, Yong-Cheol Lee and Carol Friedland	4697: Immersive VR versus BIM Platform Features for Effective AEC Team Collaboration Bitra Astaneh Asl, Andrea Huynh and Carrie Dossick
9075: Deep Learning based Crowdsourced Image Localization in Digital Twin Models for Enhanced Infrastructure Management Jinwu Xiao, Kyubung Kang and Dahyun Oh	9993: Optimizing HVAC Design for Pharmaceutical Requirements with Computational Fluid Dynamics Lijun Liu and Yilei Huang	8019: Digital twin-based heat stress monitoring system in construction Yoojun Kim and Youngjib Ham	3155: A Schema for Robotics Operations in Construction Fangxiao Li, Yuqing Hu and Robert Leicht	3089: A computational framework for identifying safe rescue routes in catastrophic urban flooding environments Yifan Wang, Jie Gong and Jiahao Xia	4306: Simulation-Based Approach for Master Planning and Scheduling in Offsite Construction Supply Chain Management A. Zaalouk, M. S. Altaf and S. Han
2824: Design Support Engine for Mass Engineered Timber Buildings Mehmet Sinan Bermek and Russel Gentry	7398: Timber Construction Automation Using Industrial Robotic Arm Integrated with an Interactive Rail System Fan Yang and Jiansong Zhang	4772: Personal Protective Equipment Detection in Extreme Construction Conditions Yuexiong Ding and Xiaowei Luo	8104: Robust Trajectory Three-dimensional Path Planning of sUAS in the Slope Surface Yajie Liu, Eric Liu, Kevin Han and William Rasdorf	6978: Devising and Implementing a Data Integration System for Building Fire Emergency Response Using a Graph Database E. Guyo and T. Hartmann	6278: Construction Cost Savings through VR-based Early Identification of Operability Issues: A Comparative Case Study Simge Girgin, Renate Fruchter and Martin Fischer

# TECHNICAL SCHEDULE: Tuesday (6/27/23) 3:15-4:15PM

TECHNICAL SESSION#9: TUESDAY (6/27/23) 3:15-4:15PM					
9A: Building Information Modeling Room 114 Chair: Jong Won Ma	9B: Infrastructure Analysis and Maintenance Room 110AB Chair: Nazila Roofigari-Esfahan	9C: Safety Applications Room 111 Chair: John Gambatese	9D: Robotics, Automation, and Control Room 110C Chair: Masoud Gheisari	9E: Resilience and Sustainability Room 102 Chair: Erzhua Che	9F: Visualization and Simulation Room 115 Chair: Bing Han
4326: Towards Improved Information Management at Commissioning Stage Jyoti Singh and Chimay J. Anumba	4066: Deep Reinforcement Learning for Optimal Planning of Fast Electric Vehicle Charging Stations at a Large Scale Jae Heo and Soowon Chang	300: Training Data Sensitivity Analysis of Deep Neural Network for Differentiating Construction Laborers with/without Safety Helmets YoungHo Kwon, Sangyoon Park, Ta Minh Luan, Sehoon Oh and Joon Heo	8018: Safety Challenges of Four-legged Robots in Construction Yuan Sun, Masoud Gheisari and Idris Jeelani	8032: Augmented Reality and Wearable Technology-Supported Biophilic Design of Senior Housing for Improving Quality of Life in Older Adults Leeann Budzevski, Neha Surana, Tanyel Bulbul and Ruichuan Zhang	5709: A Heuristic Algorithm for the Robust Resource-Constrained Project Scheduling Problem with Multi-Skilled Resources Weibao You, Zhe Xu and Ming Lu
9567: Cost Estimation for Water Loss Restoration Using Building Information Modeling, Infrared Thermography, and Xactimate Mina Mahdavi Parsa, Soowon Chang, Randy Rapp and Clark A. Cory	5603: Machine learning-based risk model for pipeline integrity management Xiaoyue Zhang, Chengcheng Tao and Ying Huang	608: One-shot Monitoring Approach for Construction Worker's Hardhat Based on Siamese Networks Daeyoung Gil and Ghang Lee	2967: Breaking Down Barriers: A Study of Challenges to Adopting Powered Exoskeletons in the US Construction Industry M. Breneman, A. Ojha, H. Jebelli, S. Mohammed and A. Akanmu	3133: Computational investigation of the flood impact on bridge infrastructures in the Great Lakes region Junyi Duan and Chengcheng Tao	6683: Identifying the design feature that causes project delay in DfMA: A dominant element analysis method for project scheduling Jianpeng Cao, Hang Zhang, Bo Pan, Ranjith Soman, Anton Savov and Daniel Hall
736: Enhancing Nuclear Power Plant Operations: An Ontology for Conditional Tasks Jinding Xing, Pengkun Liu, Pingbo Tang, Ronald Boring, George Gibson, Thomas A. Ulrich and Roger Lew	7655: A New Method of Pixel-level In-situ U-value Measurement for Building Envelopes Based on Infrared Thermography Zihao Wang, Yu Hou and Lucio Soibelman	7413: Enhancing the Time Efficiency of Personal Protective Equipment (PPE) Detection in Real Implementations using Edge Computing Mikias Gugssa, Long Li, Lina Pu, Ali Gurbuz, Yu Luo and Jun Wang	5098: Workers' Perception and Acceptance of Collaborative Robots in Construction Using the Technology Acceptance Model X. Liang, U. Rasheed, J. Cai, B. Wibranek and I. Awolusi	9279: Developing an Empathic Design Mindset through Virtual Field Trips in Buildings Renate Fruchter	6874: A Dynamic Agent-Based Optimization Model for Green Infrastructure to Address Flooding Risks Yasser Jezzini, Rayan H. Assaad and Fadi Karaa
9665: Digital twins of bridges: characteristics of a framework leading to practical implementations Kamil Korus, Marek Salamak and Jan Winkler	8980: Comparing optimization approaches in OpenSees-based direct displacement design of tall timber lateral systems S. Hossein Zargar, P. Uarac Pinto, A. R. Barbosa, A. Sinha, B. Simpson, J. van de Lindt and N. C. Brown	7246: Using Eye-tracking to Examine the Cognitive Process of Hazard Recognition in Construction VR Scenarios Yanfang Luo, Joonoh Seo and Sogand Hasanzadeh	7178: Exploring the Latency during Long-distance Robot-assisted Teleoperation and Construction Miran Seo, Yeon Chae and Youngjib Ham	9217: Modeling the Decarbonization Potential of a Time-of-Use Building Energy Benchmarking Model at the Urban Scale Abigail Andrews and Rishee Jain	6934: Optimization of Stochastic Repetitive Construction Projects: Minimizing Duration Uncertainties Hussein Abosamra, Mohamed A. Elsayad, Mohamed S. Eid and Ahmed Elhakeem
8602: 5D-Building Information Modeling (BIM): An Innovative financial decision-making framework for Mega Rail Projects Osama Hussain, Robert Moehler and Stuart Walsh	3584: Urban Pavement Performance Modeling Methodology with Artificial Intelligence Salvador Perez, Alefí Osorio and Héctor Allende	2575: Real-Time Monitoring System Framework for Fall from Roof Accident Prevention Muhammad Khan and Chukwuma Nnaji	1297: Enabling Safe Human-Robot Object Handover in Physically Collaborative Construction Work Hongrui Yu, Vineet Kamat, Carol Menassa, Wes McGee, Yijie Guo and Honglak Lee	3572: Development of Heatmap Post Disaster Grant Richard Walker and SooJin Yoon	3496: Exploring Green Wall Sizes as a Visual Property Affecting Restoration Effect and Stress Recovery in a Virtual Office Room Alireza Sedghikhanshir, Yimin Zhu, Melissa R. Beck and Amirhosein Jafari



# TECHNICAL SCHEDULE: Wednesday (6/28/23) 9:45-10:45AM

TECHNICAL SESSION# 10: WEDNESDAY (6/28/23) 9:45 - 10:45AM					
10A: Artificial Intelligence Room 114 Chair: Cristina Torres-Machi	10B: Infrastructure Analysis and Maintenance Room 110AB Chair: Behzad Esmaili	10C: Safety Applications Room 111 Chair: Chuma Nnaji	10D: Robotics, Automation, and Control Room 110C Chair: John Gambatese	10E: Resilience and Sustainability Room 102 Chair: Jennifer Lather	10F: Visualization and Simulation Room 115 Chair: Joseph Louis
7861: Deep Learning-Based Automation of Road Surface Extraction from UAV-Derived Dense Point Clouds in Large Scale Environment Thanakon Uthai and Jing Du	7265: A Multilayer Perceptron-Based Neural Network Model for Predicting Steel Bridge Coating Conditions by Integrating Bridge and Environmental Features M. Ashiqur Rahman, L. Zhang, K. Lau and X. Lv	1680: Semi-Active Exoskeleton for Forearm Muscle Strain Reduction Chukwuma Nnaji, Abdullahi Ibrahim and Ifeanyi Okpala	4357: A review of the benefits of automation and robotic application in building construction Cyril Chinonso Ejidike, Modupe Cecilia Mewomo, Timothy O. Olawumi and Osabhie Paul Esangbedo	9825: Evaluation of Hospital Pandemic Response Decisions to Design for Operational Flexibility Jennifer Lather, S. Yasaman Ahmadi, Nelson Akindele and Andrew Harms	8201: Exploring the Potential of BIM CAVE for Optimizing Construction Site Path Planning: A Review Raissa Marchiori, Solomon Ajasa and Siyuan Song
8505: From enriched point cloud to structural and MEP models: An automated approach to create semantic-geometric models for industrial facilities F. Noichl, Y. Pan, M. Saeed Mafipour, A. Braun, I. Brilakis and A. Borrmann	6996: Using Data-Driven Feature Engineering Algorithms to Determine the Most Critical Factors Contributing to the Urban Heat Island Effect Associated with Global Warming G. Assaf and R. H. Assaad	853: System dynamics modeling for investigating the retention of skilled labor in the construction market Tamima Elbashbshy and Islam El-Adaway	7799: Fully Autonomous Fire Safety Equipment Inspection Missions on a Legged Robot Angelina Aziz, Patrick Herbers, Hakan Bayer and Markus König	359: Mitigating energy efficiency inequities using integrated data-driven and parametric energy modeling Lauren E Excell, Alex Nutkiewicz and Rishree K Jain	8203: Simulation Model for Optimizing Resources among Multiple Concurrent Projects: A Case Study Raghda Moharram, Yassmin Essawy and Khaled Nassar
8811: An Improved XGBoost Model for Culvert Inspection Using Swarm Intelligence Algorithm Pouria Mohammadi, Abbas Rashidi and Sadegh Asgari	3068: Revealing Inherent Rules and Validation Frameworks for Evaluating BIM Data Regarding Disaster- and Resilience-related Regulations O. Al-Maabreh, M. Hoque, Y. Lee, K. Lee and P. Ghannad	3819: Social Contagion Theory in Construction Safety: The Effect of Susceptibility to Peer Pressure On Worker Safety Compliance Shiva Pooladvand and Sogand Hasanzadeh	7944: Pilot Study of Powered Wearable Robot Use for Simulated Flooring Work Akinwale Okunola, Abiola Akanmu, Nihar Gonsalves, Anthony Yusuf and Houtan Jebelli	2806: Selection of optimal Phase Change Material (PCM) properties to reduce energy consumption in buildings Hussein Al Jebaei, In Kyu Jeon, Abdullah Azzam, Yong Rak Kim, Juan Carlos Baltazar and Ashrant Aryal	8360: A Fuzzy Model and Decision Support Tool for Assessing and Predicting the Probability of Bankruptcy of Construction Companies Rayan H. Assaad, Ghiwa Assaf and Islam H. El-Adaway
8109: BIM, IoT and Data mining integration framework for improving green building energy resilience Guofeng Qiang and Shu Tang	5417: Radon Pollution in Educational Facilities: Investigating the Use of Digital Twins to Monitor and Control Exposure to Indoor Air Pollutants Aslan Jaliinejad and Zia Din	9349: An Agent-Based Cellular Automaton Simulation Model to Study the Worker Safety Behavior on Construction Sites: The Impacts of Different Social Influence Rules R. H. Assaad, M. A. Nabi, G. Assaf and I. El-Adaway	8429: The Importance of Situational Awareness in Future Construction Work: Toward the Effects of Faulty Robot, Trust, and Time Pressure Woei-Chyi Chang, Andrew Borowiak and Sogand Hasanzadeh	6680: Understanding households' vulnerability to joint impacts of infrastructure disruptions caused by winter storms via AI-driven chatbots Cheng Zhang and Udaykiran Konka	8650: Studying contribution of associated stakeholders in risk control of modularized construction under different project delivery methods: a graph restricted cooperative games approach M. A. Nabi and I. El-Adaway
5608: Automated Distress Detection and Measurement in Urban Asphalt Pavements using Deep Learning Paulina Gomez and Aleli Osorio		6238: Identifying Risk Factors Among New and Inexperienced Miners for Surface Mining Accidents Peiyi Lyu and Siyuan Song		9312: Predicting Emergency Medical Services Accessibility during Urban Flooding: A Hybrid Deep Learning and Simulation Approach X. Pan, N. Mohammadi and J. E Taylor	1928: SPEAR: Social Presence Enabled Augmented Reality Tool for Engineering Education Saurav Shrestha, Yongwei Shan and Nakisa Donnelly

# TECHNICAL SCHEDULE: Wednesday (6/28/23) 11AM-12PM

TECHNICAL SESSION# 11: WEDNESDAY (6/28/23) 11-12PM					
11A: Artificial Intelligence Room 114 Chair: Fei Dai	11B: Infrastructure Analysis and Maintenance Room 110AB Chair: Cristina Torres-Machi	11C: Safety Applications Room 111 Chair: Xiaowei Luo	11D: Artificial Intelligence Room 110C Chair: Abiola Akanmu	11E: Resilience and Sustainability Room 102 Chair: Don Chen	11F: Visualization and Simulation Room 115 Chair: Lu Zhang
974: Machine Learning-Based Ranking of Factors Influencing Human Movement Purposes for Supporting Human-Infrastructure Interaction Modeling Lan Zhang and Kaijian Liu	9486: A framework for remote road furniture monitoring system using smart IoT dashcams and digital twin Inbae Jeong, Youjin Jang, Israt Sharmin Dola and Moein Younesi Heravi	5993: Developing a Computational Spatial Attention Metric To Examine Workers' Visual Search Efficiency at Hazardous Construction Jobsites K. Lee, Y. Shinde, S. Hasanzadeh and B. Esmaeili	7394: Request for Information (RFI) Recommender System for Pre-Construction Design Review Application Using NLP and Computer Vision Roshan Panahi, John-Paul Kivlin and Joseph Louis	3830: Post Disaster Private Well Water Contamination with Geosocial Network: A Case Study of Post Hurricane Harvey Rong Ding, Yushun Dong, Daniel Aldrich, Jundong Li, Kelsey Pieper and Qi Wang	9228: Expert Demonstration Collection of Long-horizon Construction Tasks in Virtual Reality Rui Li and Zhengbo Zou
1963: The relationship between occupants' movement and building morphology before and during COVID-19 pandemic Yuhan Zhou and Justin Ker-Wei Yeoh	4947: Computer Vision for Infrastructure Health Monitoring: Automated Detection of Pavement Rutting from Street-Level Images Mark Shorey, Mohammad Z. Bashar and Cristina Torres-Machi	6433: A Review of Non-invasive Heat Stress Monitoring Systems for Construction Workers Using Wearable Device and Computer Vision Technology Sepehr Khorshid, Siyuan Song, Kaiwen Chen and Peiyi Lyu	5756: Cognitive Load Assessment in Learning Construction-based Sensor Data Analytics within an End-User Programming Environment M. Khalid, A. Akanmu, A. Yusuf, H. Murzi, I. Awolusi and N. Gonsalves	9338: Modeling Crowd Data and Spatial Connectivity as Graphs for Crowd Flow Forecasting in Public Urban Space Vivian Wen Hui Wong and Kincho H. Law	8982: EEG-based Classification of Cognitive Load and Task Conditions for AR Supported Construction Assembly: A deep learning approach Yimin Qin, Tanyel Bulbul and Jeremy Withers
4060: Underground Railway Station Passenger Flow Prediction Based on Long Short-Term Memory Neural Network Yuyang Shao, S. Thomas Ng, Fiona C. Y. Kwok, Shushu Fan and Reynold Cheng	8622: Evaluating the Economic Impact of Preventive Treatment Strategies for Municipal Highways Miyoungh Uhm, Giwon Shin, Hyoungkwan Kim, Namgyun Kim and Hongjo Kim	1067: Investigating the Interplay between Indoor Environmental Quality and Workers' Health and Productivity: Preliminary Results Mohamad Awada, Mirmahdi Seyedrezaei, Burcin Becerik-Gerber and Gale Lucas	5768: A Swarm Intelligence Approach for Statistical Modeling of Wind Speed and Direction: A Case Study of New York Bight N. S. Pargoo, E. Amini, M. Mohammadzadeh and M. Hajj	4154: An Intelligent IoT Device for Real-Time Cloud-Based Tracking of the Terms of Service in Smart Cities Mohsen Mohammadi, Rayan H. Assaad and Aichih Chang	5612: Reality and BIM model-driven near-miss alerting framework for construction equipment using AR interface Thai-Hoa Le and Jacob J. Lin
9984: Leveraging Artificial Intelligence for Enabling Personalized Activity-Based Workplaces Min Deng, Xi Wang, Da Li, Bo Fu, Carol C. Menassa and Vineet R. Kamat	9977: Text Mining-Based Approach for Accident Cause Analysis in Highway Construction Quan Do, Tuyen Le and Chau Le	1189: Developing Prediction Models for Monitoring Workers' Fatigue in Hot Conditions Muhammad Khan, Abdullahi Ibrahim, Chukwuma Nnaji and Ashrant Aryal	8122: Object Detection Based Knowledge Graph Creation: Enabling Insight into Construction Processes Fabian Pflitzner, Alexander Braun and André Borrmann	1896: Examining Rural-Urban Disparity in Disaster Impact and Recovery: Case of Tropical Storm Isaías Francesco Rouhana and Jin Zhu	4425: Enhancing pricing practices of subcontractors: a comparative analysis using simulation modeling Muaz Ahmed, Islam El-Adaway and Kalyn Coatney
1376: Estimation of three mutually orthogonal vanishing points from edgelets in road scenes Sourav Dutta, Linjun Lu and Fei Dai	8504: MAD-IVE: Multi-agent Distributed Immersive Virtual Environments for Vulnerable Road Users Research - Potential, Challenges, and Requirements S. Sabeti, A. Tavakoli, A. Heydari and O. Shoghli	2977: Improving Health Monitoring of Construction Workers Using Physiological Data-Driven Techniques: An Ensemble Learning-Based Framework to Address Distributional Shifts A. Ojha, Y. Liu, H. Jebelli, H. Cheng and M. Kiani	4910: Using slice-based machine learning evaluation to give readers a generalizable understanding of performance Thomas Czerniawski	8881: Shaping urban block building form to correlate PV production with electricity demand Ali Alhussain, Yumna Kurdi, Somayah Asadi and Nathan Brown	7660: Improving Multi-Crane Operations in Congested Urban Areas via Simulation of Overlapping Areas Ali Khodabandelu, Jeewoong Park, Unmesa Ray and Cristian Arteaga





