i3CE 2019

Atlanta, 17-19 June 2019

THE 2019 ASCE INTERNATIONAL CONFERENCE ON COMPUTING IN CIVIL ENGINEERING

HANYANG UNIVERSITY 한양 1939

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ATLANTIC COAST CONSULTING, INC.

Georgia Tech Civil and Environmental Engineering College of Engineering

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

i3CE 2019

Atlanta, 17-19 June 2019

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yong.cho@ce.gatech.edu

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Mississippi State University
Chen Feng
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Pingbo Tang
Arizona State University

SOCIAL PROGRAM

Monday June 17

WELCOME RECEPTION

LOCATION: Global Learning Center 2nd floor hallway, Georgia Tech

TIME: 17:00 - 19:30

WHAT'S HAPPENING: Light food and drinks

DRESS CODE: Business casual

PRICE: Free for registered participants

Wednesday June 19

BANQUET and AWARDS

LOCATION: World of Coca Cola, Atlanta

Departure at 17:45 Conference venue Finishes at 21:00 in the World of Coca Cola Includes various attractions

Shuttles will be available until 22:00

TIME: 19:00 – 21:00

WHAT'S HAPPENING: Dinner, Awards and Closing Ceremony

DRESS CODE: Business casual

PRICE: Free for registered participants

KEYNOTE SPEAKERS

Rafael L. Bras, Sc. D., Provost and Executive Vice President for Academic Affairs at Georgia Institute of Technology

The era of data rich hydrology

Tuesday June 18 at 8.20 AM

Dr. Bras is the provost and executive vice president for academic affairs at the Georgia Institute of Technology and a professor and the K. Harrison Brown Family Chair in the School of Civil and Environmental Engineering and the School of Earth and Atmospheric Sciences. Bras was a distinguished professor and dean of the School of Engineering at the University of California, Irvine. For 32 years prior, he was a professor at the Massachusetts Institute of Technology where he was Institute faculty chair, head of the Civil and Environmental Engineering department, and director of the Ralph M. Parsons Laboratory.

Brucu Akinci, Ph. D., Professor, School of Civil and Environmental at Carnegie Mellon University

Big/Small data analytics for facility/infrastructure operations and management: opportunities and challenges

Tuesday June 18 at 8:55 AM

Dr. Akinci's research interests modeling and reasoning about information-rich histories of buildings and infrastructure systems, to streamline construction and infrastructure operations and management. Dr. Akinci is the recipient of the Professor of the year award from the ASCE Pittsburgh section, the CETI Outstanding Early Career Researcher award from FIATECH and Walter L. Huber Civil Engineering Research Prize from ASCE.

Carl T. Haas, Ph. D., Professor, Chair of the Department of Civil and Environmental Engineering at University of Waterloo

Spatial States: some problems, tools, and applications in civil engineering

Wednesday June 19 at 8:45 AM

Dr. Haas' research, teaching and consulting are in the areas of construction engineering and management systems. He has received several research and teaching awards. He serves on a number of editorial boards and on professional committees for organizations such as ASCE, NSERC, and IAARC. In 2014 he received the CSCE Walter Shanly Award for outstanding contributions to the development and practice of construction engineering in Canada. In 2015 he received the ASCE Peurifoy Construction Research Award. In 2017, he received the University of Waterloo Award of Excellence in Graduate Supervision.

Dongping Fang, Ph. D., Professor, Chair of School of Civil Engineering at Tsinghua University

Resilience enhancement of infrastructure systems in smart cities

Wednesday June 19 at 9:15 AM

Dr. Fang is a former Vice President of CIB (International Council for Research and Innovation in Building and Construction) and the current leader of CIB priority theme - Resilient Urbanization. He has been honored as Visiting Professors in Australia, Sweden, and the UK, and invited as keynote speakers for many international conferences such as CIB World Building Congress and Urban Transitions Global Summit.

MONDAY 17 JUNE 2019

13:00 – 15:30	Registration (GLC 2nd floor hallway)		
15:30 – 16:00	[Session 0A] **Structure** Chair: Yang Wang (TSRB 118)		
16:00 – 17:00			Poster Session Set up (GLC 2nd floor hallway)
17:00 – 17:45	KACEPMA Meeting (GLC 225)		
17:45 – 19:30		Welcome Reception (GLC 2nd floor hallway)	Poster Session (GLC 2nd floor hallway)

TUESDAY 18 JUNE 2019

7:00 – 8:00	Continental Breakfast (GLC 2nd floor food break area)						
8:00 – 8:20	**Opening Remark** Dr. Yong K. Cho (Conference Chair), Dr. Donald R. Webster (GT CEE School Chair) (GLC 236)						
8:20 – 8:55	Keynote Speech Dr. Rafael L. Bras (Georgia Institute of Technology) (GLC 236)						
8:55 – 9:30	Keynote Speech Dr. Burcu Akinci (Carnegie Mellon University) (GLC 236)						
9:30 – 9:35	ASCE J James R Croes Medal Awad (GLC 236)						
9:35 – 10:00	Halpin Award and Talk (GLC 236)						
10:00 – 10:15	**Break**					ASCE JCCE Editors Meeting (GLC 150)	Tech Demo Setup (GLC 2nd floor hallway)
10:15 – 12:00	[Session 1A] **Reality Capture Technologies** Chair: Patricio Vela (GLC 236)	[Session 2A] **Visualization** Chair: Masoud Gheisari (GLC 233)	[Session 3A] **BIM, Ontologies and Semantic Approaches** Chair: Rui Liu (GLC 225)	[Session 4A] **Simulation and Process Modeling** Chair: Youngcheol Kang (GLC 235)	[Session 5A] **Big Data and Machine Learning** Chair: Reza Akhavian (GLC 222)		
12:00 – 13:00	**Lunch** (GLC 1st floor atrium)					EXCOM (GLC 150)	Tech Demo Session (GLC 2nd floor hallway)
13:00 – 14:45	[Session 1B] **Reality Capture Technologies** Chair: Pingbo Tang (GLC 236)	[Session 2B] **Visualization** Chair: Changbum R. Ahn (GLC 233)	[Session 3B] **BIM, Ontologies and Semantic Approaches** Chair: Jin Ouk Choi (GLC 225)	Industry Session (GLC 235)	[Session 5B] **Big Data and Machine Learning** Chair: Baabak Ashuri (GLC 222)		
14:45 – 15:00	**Break**				**Break**		
15:00 – 15:45	[Session 1C] **Robotics, Automation, and Control** Chair: Shih-Chung Kang (GLC 236)	[Session 2C] **Visualization** Chair: Semiha Ergan (GLC 233)	[Session 3C] **Built Environ. and Infra. Monitoring, Assessment, and Maintenance** Chair: Nazila Roofigari-Esfahan (GLC 225)		[Session 5C] **Big Data and Machine Learning** Chair: Abbas Rashidi (GLC 222)		
15:45 – 16:00				CII Academic Research Info. Session (GLC 235)			
16:00 – 16:45							
16:45 – 17:00	**Break**						
17:00 – 17:30	**All Stakeholder Meeting** (GLC 236)						
17:30 – 18:15	**VIMS Committee Meeting** (GLC 236)						
18:15 – 19:00	**DSA Committee Meeting** (GLC 236)						
19:00 – 19:45	**Global Center Committee Meeting** (GLC 236) **TRB's Information Systems in CM Subcommittee Meeting** (GLC 235)						

WEDNESDAY 19 JUNE 2019

7:00 – 8:00	Continental Breakfast (GLC 2nd floor food break area)						
8:00 – 8:05	Conference Report (GLC 236)						
8:05 – 8:10	JCCE 2017/2018 Best Paper Award (GLC 236)						
8:10 – 8:20	ASCE Computing Award (GLC 236)						
8:20 – 9:00	Keynote Speech Dr. Carl T. Haas (University of Waterloo) (GLC 236)						
9:00 – 9:40	Keynote Speech Dr. Dongping Fang (Tsinghua University) (GLC 236)						
9:40 – 10:00	Break						
10:00 – 12:00	[Session 1D] Robotics, Automation, and Control Chair: Jun Wang (GLC 236)	[Session 2D] Resilient and Sustainable Urban and Energy Systems Chair: Youngjib Ham (GLC 233)	[Session 3D] BIM, Ontologies and Semantic Approaches Chair: Jiansong Zhang (GLC 222)	[Session 4B] Simulation and Process Modeling Chair: Amirhosein Jafari (GLC 225)	[Session 5D] Built Environ. and Infra. Monitoring, Assessment, and Maintenance Chair: Jing Du (GLC 235)	[Session 6A] Human-technology Frontier Chair: Steven Ayer (TSRB 118)	EXCOM (GLC 150)
12:00 – 13:00	Lunch (GLC 1st floor atrium)						
13:00 – 15:00	[Session 1E] Robotics, Automation, and Control Chair: Kevin Han (GLC 236)	[Session 2E] Intelligent and Sustainable Trans. Safety, Health Monitoring, and Cond. Assessment Chair: Javier Irizarry (GLC 233)	[Session 3E] BIM, Ontologies and Semantic Approaches 4 Chair: Hubo Cai (GLC 222)	[Session 4C] Simulation and Process Modeling Chair: Ming Lu (GLC 225)	[Session 5E] Built Environ. and Infra. Monitoring, Assessment, and Maintenance Chair: Joseph Louis (GLC 235)	[Session 6B] Human-technology Frontier Chair: Fei Dai (TSRB 118)	
15:00 – 15:15	Break						
15:15 – 17:00	[Session 1F] Resilient and Sustainable Urban and Energy Systems Chair: Nan Li (GLC 236)	[Session 2F] Intelligent and Sustainable Trans. Safety, Health Monitoring, and Cond. Assessment Chair: Behzad Esmaeili (GLC 233)	[Session 3F] BIM, Ontologies and Semantic Approaches Chair: Yong-Cheol Lee (GLC 222)	[Session 4D] Human-technology Frontier Chair: Wenying Ji (GLC 225)	[Session 5F] Built Environ. and Infra. Monitoring, Assessment, and Maintenance Chair: Sharareh Kermanshachi (GLC 235)		
17:00 – 17:15							Education committee meeting (GLC 150)
17:15 – 17:45	Break						
17:45 – 19:00	Move to World of Coke (The last shuttle bus will depart at 18:45 in front of GLC on 5th street)						
19:00 – 21:00	Banquet and Awards						

13:00 – 15:30 **Registration**

15:30 – 17:00 **Presentation Session**

[Session 0A] Structure

Chair: Yang Wang (Georgia Institute of Technology)

15:30 Finite Element Model Updating of a Steel Pedestrian Bridge Model
Xinjun Dong and Yang Wang

15:45 Response prediction of systems experiencing operational and environmental variability
Konstantinos Tatsis, Eleni Chatzi and Vasilis Dertimanis

16:00 Using regularized linear-regression surrogate models for accurate probabilistic structural identification
Sai G.S. Pai and Ian F.C. Smith

16:15 Glue-laminated Timber Arch Bridge Inspection using UAV
Junwon Seo, Luis Duque and James Wacker

16:30 A computational geometry approach to the life-cycle modeling of remotely-sensed defects
Sara Mohamadi and David Lattanzi

16:45 Damping estimation from full-scale traffic-induced vibrations of a suspension bridge
Nicolo Daniotti, Etienne Cheynet, Jasna Bogunovich Jakobsen and Jonas Thor Snaebjoernsson

17:00 – 17:45 **KACEPMA meeting**

17:00 – 19:30 **Poster Session / Welcome Reception**

[Poster Session]

Towards Distributed Urban Infrastructure Systems: Automated Identification of the Natural Spatial Scales of Cities
Rohan Aras (Stanford University)

Understanding the Public and Expert Perspective on Physical, Policy, and Social Post-disaster Recovery Factors: A Comparative Analysis
Behzad Rouhanizadeh (University of Texas at Arlington)

Development of a Conceptual Model to Measure the Resiliency Level of Critical Transportation Infrastructures
Thahomina Jahan Nipa (University of Texas at Arlington)

A Sensitivity Analysis Approach to Investigate the Impact of Late Change orders on Labor Productivity in Water Infrastructure Projects
Elnaz Safapour (University of Texas at Arlington)

Vulnerability assessment of flood control networks through a graph-theoretic approach
Hamed Farahmand (Texas A&M University)

Parametric LCA of CCHP system integrated with solar energy under multiple scenarios
Junchen Yan (Georgia Institute of Technology)

Research Trend Analysis on Application of Big Data in Construction Industry
Hu Yong Kim (Sunkyunkwan University)

Trash Talk: Increase Recycling Behavior by Providing Real-time Feedback
Amir Ashrafi (University of Virginia)

Improved Modeling of Ideal Fluid Flow Using Advances in the Greedy Optimization Algorithm for the Method of Fundamental Solutions
Kameron Grubaugh (United States Military Academy at West Point)

Vision-based Obstacle Removal System for Autonomous Ground Vehicles Using a Robotic Arm
Khashayar Asadi (North Carolina State University)

Leveraging the Interaction between Humans and Building Systems for Enhanced Operation and Maintenance of Office Buildings
Yewande S. Abraham (Rochester Institute of Technology)

Agent-based Modeling Framework for Simulation of Societal Impacts of Infrastructure Service Disruptions during Disasters
Amir Esmalian (Texas A&M University)

Assessing the Potential Risk of Knee Musculoskeletal Disorders among Roofers in Shingle Installation Operations
Amrita Dutta (West Virginia University)

Virtual Manipulation in an Immersive Virtual Environment: Simulation of Virtual Assembly
Mojtaba Noghabaei (North Carolina State University)

Evaluation of 4D BIM use to reduce Transportation Waste in construction production processes
Cristina Toca Pérez (Georgia Institute of Technology)

The Sound Insulation Estimation of Floating Floor Focusing on Heavy/soft Impact Sound
Jongwoo Cho (Seoul National University)

Integrating Societal Dimensions into Infrastructure Resilience Modeling: The Impacts of Service Disruptions on Household Well-being in Disasters
Jennifer Dargin (Texas A&M University)

Inferring Occupant Ties in Dynamic Office Environments
Andrew Sonta (Stanford University)

A competition based game activity for educating machine learning in civil engineering course
June Young Park (University of Texas at Austin)

Vulnerability Analysis of Coupled Emergency Service and Transportation Network using Network Percolation: Case Study of Houston during Hurricane Harvey
Bahrulla Abdulla (Texas A&M University)

TDOA localization of abnormal sound source on construction site
Jin Ho Ko (Sungkyunkwan University)

Resilience Planning in Hazards-Humans-Infrastructure Nexus: Assessment of the Impacts of Sea-level Rise on Coastal Water Supply Infrastructure
Kambiz Rasoulkhani (Texas A&M University)

Using Implicit Averaging in Construction Simulation Optimization Models
Mohammed Mawlana (North Carolina A & T State University)

Using Agent-Based Models to Study Knowledge Sharing on Construction Sites
Daoud A. Kiomjian (American University of Beirut)

A transfer learning approach for analyzing urban building energy retrofits
Alex Nutkiewicz (Stanford University)

Occupant-Building Interaction (OBI) Model for University Buildings
Poorvesh Dongre (Virginia Tech)

Redispersible Polymer Powder Properties for 3D Printing Cement Based Exterior Finishing Materials
Hun Song (Korea Institute of Ceramic Engineering & Technology)

Identifying new defect types using LDA-based topic modeling of defect reports from large collective housing in South Korea
Kahyun Jeon (Yonsei University)

Assessing Workplace Hazards Affecting Human Error Based On Dissipative Theory
Mei Liu (Tsinghua University)

Personalize Complex Engineering Information for Facility Shutdown Operators via Digital Twin of Human Cognition
Yangming Shi (University of Florida)

A Sustainable Strategy to Balance between Historic Preservation and Sustainable Development in Washington DC
Donghwan Kim (University of Texas at Austin)

Influence of Modeling Errors on Deficiency Identification in a Steel Railway Bridge Floor System
Daniel Linzell (University of Nebraska-Lincoln)

8:00 – 8:20	**Opening Remark**	Dr. Yong K. Cho (Conference Chair), Dr. Donald R. Webster (GTCEE School Chair)
8:20 – 8:55	**Keynote Speech**	Dr. Bras (Georgia Institute of Technology)
8:55 – 9:30	**Keynote Speech**	Dr. Burcu (Carnegie Mellon University)
9:30 – 10:00	**Halpin Award and Talk**	

10:00 – 10:15 Break

10:15 – 12:00 Parallel Sessions

[Session 1A] Reality Capture Technologies

Chair: Patricio Vela (Georgia Institute of Technology)

10:15 **Scan2BrIM: IFC Model Generation of Concrete Bridges from Point Clouds**
Yipu Zhao and Patricio Vela

10:30 **Falling objects detection for near miss incidents identification on construction site**
Chengqian Li and Lieyun Ding

10:45 **Fast Dataset Collection Approach for Articulated Equipment Pose Estimation**
Ci-Jyun Liang, Kurt Lundeen, Wes Mcgee, Carol Menassa, Sanghyun Lee and Vineet Kamat

11:00 **Emerging Construction Technologies: State of Standard and Regulation Implementation**
Ifeanyi Okpala, Chukwuma Nnaji and Ibukun Awolusi

11:15 **Nuclear Power Plant Disaster Site Simulation using Rigid Body Physics**
Jing Dao Chen, Kinam Kim, Yong K. Cho, Joo Sung Lee, Byeol Kim, Yong Han Ahn and Junsuk Kang

11:30 **Dimensional Quality Inspection of Prefabricated MEP Modules with 3D Laser Scanning**
Jingjing Guo and Qian Wang

11:45 **Segmentation Approach to Detection of Discrepancy between As-built and As-built planned Structure Images on a Construction Site**
Juhyeon Bae and Sanguk Han

[Session 2A] Visualization

Chair: Masoud Gheisari (University of Florida)

10:15 **Hazard Identification Training Using 360-Degree Panorama vs. Virtual Reality Techniques: A User-Centered Pilot Study**
Howard Frank Moore, Ricardo Eiris, Masoud Gheisari and Behzad Esmaeili

10:30 **Application of Virtual Reality to Investigate Driver's Route Choice in an Interstate Highway**
Sanaz Saeidi, Yimin Zhu, Supratik Mukhopadhyay, Ravindra Gudishala and Zhen Xu

10:45 **Comparing Virtual Reality and 2-Dimensional Drawings for the Visualization of a Construction Project**
Claudia Calderon-Hernandez, Daniel Paes, Javier Irizarry and Xavier Brioso

11:00 **The Relevance of Visual Cues in Immersive Environments: Does Pictorial Realism Matter?**
Daniel Paes and Javier Irizarry

11:15 **Annotating 2D imagery with 3D kinematically configurable assets of construction equipment for training pose-informed activity analysis and safety monitoring algorithms**
Dominic Roberts, Yunpeng Wang, Ali Sabet and Mani Golparvar-Fard

11:30 A First Step in Generating a Decision-Making Framework for the Development of Interactive Workspaces
Fadi Castronovo, Mariana Barbosa Silva, Silvia Mastrolembo Ventura and Reza Akhavian

11:45 An Immersive Approach to Construction Cost Estimating
Fopefoluwa Bademosi, Ralph Tayeh and Raja R.A. Issa

[Session 3A] BIM, Ontologies and Semantic Approaches

Chair: Rui Liu (University of Florida)

10:15 Evaluation of IFC for the Augmentation of Intelligent Transportation Systems (ITS) into Bridge Information Models (BrIM)
Alireza Adibfar and Aaron Costin

10:30 BIM-based Estimation of Wood Waste Stream: The Case of an Institutional Building Project
Amal Bakchan, Beatriz Guerra, Kasey Faust and Fernanda Leite

10:45 Applying Deep Learning and Building Information Modeling to Indoor Positioning Based on Sound
Chih-Hsiung Chang, Chia-Ying Lin, Ru-Guan Wang and Chien-Cheng Chou

11:00 A BIM-enabled Design Method for Green Plantation on Building Sites
Ching-Chun Chou, Shang-Hsien Hsieh and Yun-Tsui Chang

11:15 Using Public Sentiment for Rapid Damage Assessment by Crowdsourcing Data: Hurricane Matthew Case Study
Faxi Yuan and Rui Liu

11:30 Formalizing Construction Sequencing Knowledge and Mining Company-Specific Best Practices from Past Project Schedules
Fouad Amer and Mani Golparvar-Fard

11:45 Integration of Building Information Modeling and Facilities Management: A Case Study at Worcester Polytechnic Institute
Guillermo F. Salazar, Mohamed Aboulezz and Sergio Alvarez

[Session 4A] Simulation and Process Modeling

Chair: Youngcheol Kang (Yonsei University)

10:15 A Network-Based Methodology for Quantitative Knowledge Gap Identification in Construction Simulation and Modeling Research
Ibrahim Abotaleb and Islam El-Adaway

10:30 Use of Simulation Software and Passive Design Strategies for School Design
Chang-Ray Chen and Frida Cobar

10:45 Conceptual Quantitative Model to Group Risks in Fast-Track Construction Projects
Claudia Garrido Martins, Susan M. Bogus and Vanessa Valentin

11:00 A hybrid simulation approach for understanding the social contagion effect of safety violations within the construction crew
Huakang Liang and Ken-Yu Lin

11:15 Optimal Construction Facilities Location Selection for Linear Infrastructure Projects
Amr G. Mansour, Mohamed Eid and Emad Elbeltagi

11:30 Performance Assessment for Claim Management in Construction
Wonkyoung Seo and Youngcheol Kang

[Session 5A] Big Data and Machine Learning

Chair: Reza Akhavian (California State University, East Bay)

10:15 Pressure Transient Detection and Pattern Discovery in Water Distribution Systems
Lu Xing and Lina Sela

10:30 Estimating Commuting Patterns from High Resolution Phone GPS Data
Bita Sadeghinasr, Armin Akhavan and Qi Wang

10:45 A Deep Learning Methodology for Construction Equipment Activity Analysis
Carlos Hernandez, Trevor Slaton, Vahid Balali and Reza Akhavian

11:00 A Machine Learning Framework to Identify Employees at Risk of Wage Inequality: U.S. Department of Transportation Case Study

Hamid R. Karimian, Behzad Rouhanizadeh, Amirhosein Jafari and Sharareh Kermanshachi

11:15 Machine Learning based Automatic Concrete Microstructure Analysis: A Study on Effect of Image Magnification
Srikanth Sagar Bangaru and Chao Wang

11:30 Business Failure Prediction with LSTM RNN in the Construction Industry
Youjin Jang, In-Bae Jeong, Yong K. Cho and Yonghan Ahn

11:45 Automated Activity Recognition of Construction Equipment Using a Data Fusion Approach
Behnam Sherafat, Abbas Rashidi, Yong-Cheol Lee and Changbum R. Ahn

12:00 – 13:00 Lunch

13:00 – 14:45 Parallel Sessions

[Session 1B] Reality Capture Technologies

Chair: Pingbo Tang (Arizona State University)

13:00 Spatial Change Tracking of Structural Elements of a Girder Bridge under Construction Using 3D Point Cloud
Sudip Subedi, Vamsi Kalasapudi and Nipesh Pradhananga

13:15 A 3D irregular packing algorithm using point cloud data
Yinghui Zhao and Carl Haas

13:30 Visual-Semantic Alignments for Automated Interpretation of 3D Imagery Data of High-Pier Bridges
Zhe Sun, Pingbo Tang, Ying Shi and Wen Xiong

13:45 Exploring the Potential of Image-based 3D Geometry and Appearance Reasoning for Automated Construction Progress Monitoring
Jacob Je-Chian Lin, Jae Yong Lee and Mani Golparvar-Fard

14:00 Reconstruction of Wind Turbine Blade Geometry and Internal Structure from Point Cloud Data
Benjamin Tasistro-Hart, Tristan Al-Haddad, Lawrence Bank and Russell Gentry

14:15 Semantic segmentation of building point clouds using deep learning: A method for creating training data using BIM to point cloud label
Thomas Czerniawski and Fernanda Leite

14:30 As-built BIM updating based on image processing and artificial intelligence
Cheng Zhang and Hong Huang

[Session 2B] Visualization

Chair: Changbum R. Ahn (Texas A&M University)

13:00 3D Registration of Indoor Point Clouds for Augmented Reality
Bilawal Mahmood and Sanguk Han

13:15 Immersion into Holographic Spaces to Enhance Engineering and Architecture Design Interpretations
Ivan Mutis and Rohit Rameshrao Desai

13:30 Human-in-the-loop Simulation for Crane Lift Planning in Modular Construction On-site Assembly
Jiantsen Goh, Songbo Hu and Yihai Fang

13:45 Comprehensible and Interactive Visualizations of Spatial Building Data in Augmented Reality
Joao P. Carneiro, Mahsa Pahlavikhah-Varnosfaderani, Vahid Balali and Arsalan Heydarian

14:00 Development of a Virtual Reality Integrated Community-scale Eco-Feedback System
Lei Xu, Abby Francisco, Neda Mohammadi and John Taylor

14:15 Virtual Manipulation in an Immersive Virtual Environment: Simulation of Virtual Assembly
Mojtaba Noghabaei, Khashayar Asadi and Kevin Han

14:30 Participatory and Evolutionary Fire Simulation via a Sensitive Control of Key Scenery Parameters
Qi Zhu, Jing Du, Yangming Shi, Qi Wang and Yingzi Lin

[Session 3B] BIM, Ontologies and Semantic Approaches

Chair: Jin Ouk Choi (University of Nevada)

13:00 Developing a BIM-assisted Access Point Placement Optimization Algorithm for Enhancing Wi-Fi Fingerprint-based Indoor Positioning
Jack C.P. Cheng and Chun Ting Li

13:15 Mapping Precast: Linking Global and Local Descriptions of Architectural Precast Concrete
Jeffrey Collins and Russell Gentry

13:30 A multi-LOD model for visualizing building information models' vagueness
Jimmy Abualdenien and André Borrmann

13:45 Identifying Potential Innovative Technologies and Management Approaches for Design Standardization
Jin Ouk Choi, Young Kwak, Jennifer Shane and Binit Shrestha

14:00 Introduction of a New BIM Dataset of Architecture, Engineering, and Construction Objects and Geometric Signatures
Jin Wu and Jiansong Zhang

14:15 Drawing recognition and line-text extraction-based automated BIM model generation
Juhee Rho, Hyun-Soo Lee and Moonseo Park

14:30 Ontology-based Framework for Checking the Constructability of Concrete Volumetric Construction Submodules from BIM
Justin K.W. Yeoh and Runxing Jiao

[Session 5B] Big Data and Machine Learning

Chair: Baabak Ashuri (Georgia Institute of Tech)

13:00 Leveraging the Blockchain Technology in AEC Industry during the Design Development Phase
Sulekha Singh and Baabak Ashuri

13:15 Reference Signal based Method to Remove Respiration Noise in Electrodermal Activity (EDA) Collected from the Field
Gaang Lee, Byungjoo Choi, Houtan Jebelli, Changbum Ahn and Sanghyun Lee

13:30 Unsupervised Machine Learning for Augmented Data Analytics of Building Codes
Ruichuan Zhang and Nora El-Gohary

13:45 A Data-Driven and Physics-Based Approach to Exploring Interdependency of Interconnected Infrastructures
Shenghua Zhou, Thomas Shiu Tong Ng, Yifan Yang, Frank Jun Xu and Dezhi Li

14:00 Integrating Spatial and Attentional Cues for Construction Working Group Identification: A Long Short-Term Memory Based Machine Learning Approach
Jiannan Cai, Yuxi Zhang and Hubo Cai

14:15 Development of Massive Point Cloud Data Geoprocessing Framework for Construction Site Monitoring
Minh Hieu Nguyen, Sanghyun Yoon, Sangyoon Park and Joon Heo

14:45 – 15:00 **Break**

15:00 – 16:45 **Parallel Sessions**

[Session 1C] Robotics, Automation, and Control

Chair: Shih-Chung Kang (National Taiwan University)

15:00 4D-BIM based Optimal Flight Planning for Construction Monitoring Applications using Camera-equipped UAVs
Amir Ibrahim and Mani Golparvar-Fard

15:15 Semantic Relation Detection Between Construction Entities to Support Safe Human-Robot Collaboration in Construction
Daeho Kim, Ankit Goyal, Alejandro Newell, Sanghyun Lee, Jia Deng and Vineet Kamat

15:30 Task Allocation and Route Planning for Robotic Service Networks with Multiple Depots in Indoor Environments
Bharadwaj Mantha and Borja Garcia de Soto

15:45 Vision-based Excavator Activity Recognition and Productivity Analysis in Construction
Chen Chen, Zhu Zhenhua, Amin Hammad and Ahmed Walid

16:00 The design of future construction lab
Cheng Hsuan Yang, Tzong Hann Wu and Shih-Chung Kang

16:15 Digital Twins as the Next Phase of Cyber-Physical Systems in Construction
Congwen Kan and Chimay Anumba

16:30 Assessments of Intuition and Efficiency: Remote Control of the Arm of Excavator in Operational Space
Dong-Ik Sun, Sang-Keun Lee, Yong-Seok Lee, Sang-Ho Kim, Jun Ueda, Yong K Cho, Yong-Han Ahn and Chang-Soo Han

[Session 2C] Visualization

Chair: Semiha Ergan (New York University)

15:00 Interactive Holograms for Improved Information Communication
Ralph Tayeh, Fopefoluwa Bademosi and Raja R. A. Issa

15:15 Integrating BIM and Game Engine for Simulation Interactive Life Cycle Analysis Visualization
Sagid Omaran, Abdulaziz Alghamdi, Salam Alharishawi and Decker Hains

15:30 Understanding Roofer's Risk Compensatory Behavior through Passive Haptics Mixed-Reality System
Sogand Hasanzadeh and Jesus M. de la Garza

15:45 Using Immersive Virtual Reality to Improve Choosing by Advantages System for the Selection of Fall-Protection Measures
Xavier Brioso, Claudia Calderon-Hernandez, Javier Irizarry and Daniel Paes

16:00 First Responders' Spatial Working Memory of Large-scale Buildings: Implications of Information Format
Yangming Shi, Jing Du, Shyam Prathish Sargunam and Eric Ragan

16:15 Capabilities of Mixed Reality Applications for Architecture and Construction: A Comparative Review with HoloLens
Yilei Huang, Samjhana Shakya and Lianbo Zhu

16:30 Integrating Biometric Sensors, VR, and Machine Learning to Classify EEG Signals in Alternative Architecture Designs
Zhengbo Zou, Xinran Yu and Semiha Ergan

[Session 3C] Built Environment and Infrastructure Monitoring, Assessment, and Maintenance

Chair: Nazila Roofigari-Esfahan (Virginia Tech)

15:00 A Deep Learning Based Automated Structural Defect Detection System for Wastewater Pipelines
Srinath Kumar and Dulcy Abraham

15:15 A Connected Work Zone Hazard Detection System for Highway Construction Workers
Wenjun Han and Nazila Roofigari-Esfahan

15:30 Feasibility Assessment of Heat Flux Sensor for the Human-in-the-loop HVAC Operation
Wooyoung Jung, Matthew Chan, Farrokh Jazizadeh and Thomas Diller

15:45 A Scalable Cyber-Physical System Data Acquisition Framework for the Smart Built Environment
Xinghua Gao, Pardis Pishdad-Bozorgi, Dennis Shelden and Shu Tang

16:00 Video-based Activity Forecasting for Construction Safety Monitoring Use Cases
Shuai Tang, Mani Golparvar-Fard, Milind Naphade and Murali Gopalakrishna

16:15 Top-Down Partitioning of Reinforced Concrete Bridge Components
Yipu Zhao, Haotian Wu and Patricio Vela

16:30 CLOI: A Shape Classification Benchmark for Industrial Facilities
Eva Agapaki, Alex Glyn-Davies, Sara Mandoki and Ioannis Brilakis

[Session 5C] Big Data and Machine Learning

Chair: Abbas Rashidi (University of Utah)

15:00 Neuro Fuzzy Inference Systems for Estimating Normal Concrete Mixture Proportions
Jorge Santamaria, Luis Morales and Paulina Lima

15:15 Identifying patterns in Design-Build projects with unsuccessful project performance: a cluster analysis approach
Yunping Liang, Baabak Ashuri and Wei Sun

15:30 Deep Learning with Spatial Constraint for Tunnel Crack Detection
Qingquan Li, Qin Zou, Jianghai Liao, Yuanhao Yue and Song Wang

15:45 An Improved Convolutional Neural Network System for Automatically Detecting Rebar in GPR data
Zhongming Xiang, Abbas Rashidi and Ge Ou

16:00 Deep Learning Models for Content-Based Retrieval of Construction Visual Data
Nipun Nath and Amir Behzadan

16:15 CNN-based Deep Architecture for Reinforced Concrete Delamination Segmentation through Thermography
Chongsheng Cheng, Zhexiong Shang and Zhigang Shen

16:30 Machine Learning-Based Prediction of Building Water Consumption for Improving Building Water Efficiency
Lufan Wang and Nora El-Gohary

[Demo Session]

Building a Cloud-based Data Collaboratory for Hurricane Damage Assessment
Mengyang Guo, Yi Yu, and Jie Gong

Smart Hearing Protection Training Assistance System for Self-Performance Evaluation and Rectification
Srikanth Sagar Bangaru, Chao Wang, and Xu Zhou

Object Recognition from Robotic Scans of the Built Environment
Jingdao Chen, Pileun Kim, and Yong K. Cho

An Integrated Construction Worker Monitoring System for Tracking Locations and Recognizing Motions of the Workers
In Bae Jeong, Kinam Kim, and Yong K. Cho

Real-Time Indoor 3D SLAM Capability for sUAS
Minki Kim, Yong K. Cho

PARS: 360-Degree Panoramas of Reality for Construction Safety Training
R.Eiris, M.Gheisari, and B. Esmaeili

Analyzing Workers' Collective Response Patterns for Identifying Slip, Trip, and Fall Hazards
Kanghyeok Yang, Changbum R. Ahn, and Namgyun Kim

Toward Practical Implementation of Wi-Fi-based Activity Recognition in Smart Home
Hoonyong Lee, Changbum R. Ahn, Nakjung Choi, Sangyeop Kim, Toseung Kim

Towards an Interactive Data Visualization Platform to Support Sustainable Design, Management, and Operations of Urban Systems
Zheng Yang and Rishee K. Jain

8:00 – 8:10	**Conference Report**	
8:10 – 8:20	**ASCE Computing Award**	
8:20 – 9:00	**Keynote Speech**	Dr. Haas (University of Waterloo)
9:00 – 9:40	**Keynote Speech**	Dr. Fang (Tsinghua University)
9:40 – 10:00	**Break**	
10:00 – 12:00	**Parallel Sessions**	

[Session 1D] Robotics, Automation and Control

Chair: Jun Wang (Mississippi State University)

10:00 Evaluation of Machine Learning Algorithms for Worker's Motion Recognition using Motion Sensors
Kinam Kim, Jingdao Chen and Yong K. Cho

10:15 Real-time Hazard Proximity Detection – Localization of Workers Using Visual Data
Idris Jeelani, Hariharan Ramshankar, Kevin Han, Alex Albert and Khashayar Asadi

10:30 A computational framework for characterizing multiple object tracking methods in construction field applications
Jiawei Chen and Pingbo Tang

10:45 Sequential Pattern Learning of Visual Features and Operation Cycles for Vision-based Action Recognition of Earthmoving Excavators
Jinwoo Kim, Seokho Chi and Minji Choi

11:00 Modelling and control of an unmanned excavator vehicle for Dangerous works at Construction Field
Joo-Sung Lee, Byeol Kim, Dong-Ik Sun, Chang-Soo Han and Yong-Han Ahn

11:15 Automatic Wall Defect Detection Using an Autonomous Robot: A Focus on Data Collection
Jun Wang and Chaomin Luo

11:30 Real-time Scene Segmentation Using a Light Deep Neural Network Architecture for Autonomous Robot Navigation on Construction Sites
Khashayar Asadi, Pengyu Chen, Kevin Han, Tianfu Wu and Edgar Lobaton

11:45 Planning and Execution for Geometrically Adaptive BIM-Driven Robotized Construction Processes
Kurt Lundeen, Vineet Kamat, Carol Menassa and Wes McGee

[Session 2D] Resilient and Sustainable Urban and Energy Systems

Chair: Youngjib Ham (Texas A&M University)

10:00 Characterization of the Vulnerability of Road Networks to Flooding using Network Percolation Approach
Bahrulla Abdulla, Ali Mostafavi and Bjorn Birgisson

10:15 Exploring the Effect of Data Granularity on Personalized Normative Messaging Interventions for Reducing Household Energy Consumption
Kwonsik Song, Kyle Anderson, Sanghyun Lee, Kaitlin Raimi and Sol Hart

10:30 System-Based Vulnerability and Resilience Assessment in Mega-Scale Transportation Systems: Towards Data and Model-Driven Methodologies
Eyuphan Koc, Barbaros Cetiner, Lucio Soibelman and Ertugrul Taciroglu

10:45 Mapping Local Vulnerabilities into a 3D City Model through Social Sensing and the CAVE system toward Digital Twin City
Jaeyoon Kim, Hongjo Kim and Youngjib Ham

11:00 Spatial and temporal modeling of urban building energy usage using machine learning
Jonathan Roth, Aimee Bailey, Sonika Choudhary and Rishee Jain

11:15 Evaluation of Post-wildfire Flood Impacts on Earth Dams: A Pareto Approach
Krishna Chaitanya Jagadeesh Simma, Vanessa Valentin and Susan M Bogus

11:30 Formalizing an Integrated Multidisciplinary Decision-Making Methodology for Ranking Sustainable Infrastructure Designs
Bin Xue and Shan Li

11:45 Machine Learning Applications in Facility Life-cycle Cost Analysis: A Review
Xinghua Gao, Pardis Pishdad-Bozorgi, Dennis Sheldenand Yuqing Hu

[Session 3D] BIM, Ontologies and Semantic Approaches

Chair: Jiansong Zhang (Purdue University)

10:00 Blockchain Technologies in BIM Workflow Environment
Nawari Nawari and Shriraam Ravindran

10:15 Automating Design Review with Artificial Intelligence and BIM: State of the Art and Research Framework
Rafael Sacks, Tanya Bloch, Meir Katz and Raz Yosef

10:30 Model Information Checking to Support Interoperable BIM Usage in Structural Analysis
Ran Ren and Jiansong Zhang

10:45 Construction Site Path Planning Optimization through BIM
Siyuan Song and Eric Marks

11:00 Georeferencing IFC: A novel solution for infrastructure objects
Štefan Jaud, Andreas Donaubauer and André Borrmann

11:15 A Method to Provide Integrated Design through Systems-level Automation
Steve Barg, Forest Flager and Martin Fischer

11:30 Selective Deconstruction Programming for Adaptive Reuse of Buildings
Benjamin Sanchez, Christopher Rausch and Carl Haas

11:45 Level of Detail (LOD) Guideline for Wood Building Elements to Support BIM-Based Wood Construction Cost Estimation
Temitope Akanbi, Jiansong Zhang and Yong-Cheol Lee

[Session 4B] Simulation and Process Modeling

Chair: Amirhosein Jafari (Louisiana State University)

10:00 Analysis of Lighting Occupancy Sensor Installation in Building Renovation using Agent-Based Modeling of Occupant Behavior
Seddigheh Norouziasl, Amirhosein Jafari and Chao Wang

10:15 Proposing a Multi-Staged Calibration Methodology for System Dynamics Construction Management Models
Ibrahim Abotaleb and Islam El-Adaway

10:30 Three-Tiered Simulation Framework for Modeling Bridge Girders Fabrication Processes in a Steel Fabrication Shop
Ming Lu, Monjurul Hasan and Arash Mohsenijam

10:45 Multi-Objective Simultaneous Optimization for Linear Projects Scheduling
Mohamed S. Eid, Emad E. Elbeltagi and Islam H. El-Adaway

11:00 A Cost Model to Evaluate the Economic Performance of Contour Crafting
Xun Zhang, Ian Flood, Yuanxin Zhang, Hashem Izadi Moudand Moshen Hatami

11:15 Integrating Fuzzy Agent-Based Modeling and Multi-Criteria Decision-Making for Analyzing Construction Crew Performance
Nebiyu Siraj Kedir, Mohammad Raoufi and Aminah Robinson Fayek

11:30 Effect of Improving Cost Estimating Accuracy in Competitive Bidding
Sadegh Asgari

11:45 A Simulation Framework for Technology Adoption Decision Making in Construction Management: A Composite Model
Chukwuma Nnaji, Ifeanyi Okpala and Sungjin Kim

[Session 5D] Built Environment and Infrastructure Monitoring, Assessment, and Maintenance

Chair: Jing Du (University of Florida)

10:00 Exploring the Effects of Brightness and Color Temperature on Occupant Emotions
Alan Wang and Arsalan Heydarian

10:15 Data-driven Remaining Life Prediction to Plan Operations Shutdown and Maintenance of an Industrial Plant
Ali Bayesteh, Li Duanshun and Ming Lu

10:30 Saliency Detection Analysis of Pedestrians' Physiological Responses to Assess Adverse Built Environment Features
Jinwoo Kim, Changbum R. Ahn, Theodora Chaspari and Megha Yadav

10:45 Predictive Model Development to Perform Condition Assessment on Pipeline Networks
Behzad Rouhanizadeh and Sharareh Kermanshachi

11:00 Feasibility of Low-Cost Infrared Thermal Imaging to Assess Occupants' Thermal Comfort
Da Li, Carol Menassa and Vineet Kamat

11:15 A Data Fusion Platform for Supporting Bridge Deck Condition Monitoring by Merging Aerial and Ground Inspection Imagery
Zhexiong Shang, Chongsheng Cheng and Zhigang Shen

11:30 Towards a Review of Building Energy Forecast Models
Hannah Daniel, Bharadwaj Mantha and Borja Garcia de Soto

11:45 Qualitative Assessment of Indirect Risks Associated with Unmanned Aerial Vehicle Flights over Construction Job Sites
Hashem Izadi Moud, Ian Flood, Alireza Shojaei, Yuanxin Zhang, Xun Zhang, Mehdi Tadayon and Mohsen Hatami

[Session 6A] Human-technology Frontier 1

Chair: Steven Ayer (Arizona State University)

10:00 Key Attributes of Change Agents for Successful Technology Adoptions in Construction Companies: A Thematic Analysis
Afiqah R. Radzi, Hashim R. Bokhari, Rahimi A. Rahman and Steven K. Ayer

10:15 Improved finance-based scheduling optimization model
Ahmed Shiha and Ossama Hosny

10:30 Enhancing Construction Safety Monitoring Through the Application of Internet of Things and Wearable Sensing Devices: A Review
Ibukun Awolusi, Chukwuma Nnaji, Eric Marks and Matthew Hallowell

10:45 Optimizing Neighborhood-Scale Walkability
Andrew J. Sonta and Rishee K. Jain

11:00 Reliability and Validity of a Posture Matching Method Using Inertial Measurement Unit-based Motion Tracking System for Construction Jobs
Wonil Lee, Jia-Hua Lin, Stephen Bao and Ken-Yu Lin

11:15 Review of Human-in-the-Loop Cyber-Physical Systems (HiLCPS): The Current Status From Human Perspective
Behnam Moshkini Tehrani, Jun Wang and Chao Wang

11:30 Investigation and Analysis of Human, Organizational, and Project Based Rework Indicators in Construction Projects
Elnaz Safapour and Sharareh Kermanshachi

11:45 Seeding Strategies in Online Social Networks for Improving Information Dissemination of Built Environment Disruptions in Disasters
Chao Fan, Yucheng Jiang and Ali Mostafavi

12:00 – 13:00 **Lunch**

13:00 – 15:00 **Parallel Sessions**

[Session 1E] Robotics, Automation, and Control

Chair: Kevin Han (NC State University)

13:00 Enhancing Visual SLAM with Occupancy Grid Mapping for Real-Time Locating Applications in Indoor GPS-Denied Environments
Lichao Xu, Chen Feng, Vineet Kamat and Carol Menassa

13:15 Industrialized Construction: Emerging Methods and Technologies
Mohamad Ahmadzade Razkenari, Qi Bing, Andriel Evandro Fenner, Hamed Hakim, Aaron Costin and Charles Kibert

13:30 Automating the Digital Fabrication of Concrete Formwork in Building Projects: Workflow and Case Example
Mohammad Sadra Fardhosseini, Hamid Abdirad, Carrie Dossick, Hyun Woo Lee, Renzo DiFuria and Joshua Lohr

13:45 State-of-the-Art Review on the Applicability of AI Methods to Automated Construction Manufacturing
Mohsen Hatami, Ian Flood, Bryan Franz and Xun Zhang

14:00 Game Simulation to Support Construction Automation in Modular Construction Using BIM and Robotics Technology – Stage I
Oscar Wong Chong and Jiansong Zhang

14:15 UAV-UGV Cooperative 3D Environmental Mapping
Pileun Kim, Leon Price and Yong Cho

14:30 Vision-based Obstacle Removal System for Autonomous Ground Robots Using Robotic Arm
Khashayar Asadi, Rahul Jain, Ziqian Qin, Mingda Sun, Mojtaba Noghabaei, Kevin Han, Jeremy Cole and Edgar Lobaton

14:45 Factors Influencing Measurement Accuracy of Unmanned Aerial Systems (UAS) and Photogrammetry in Construction Earthwork
Xi Wang, Julia Chen and Gabriel Dadi

[Session 2E] Intelligent and Sustainable Transportation safety, Health monitoring, and Condition Assessment

Chair: Javier Irizarry (Georgia Institute of Technology)

13:00 Spatiotemporal Scan Statistics for the Identification of Density-Based Clusters of Pipe Failure Events in Drinking Water Distribution Systems
Ahmed Abokifa and Lina Sela

13:15 Investigation of the Influence of Twitter User Habits on Sentiment of Their Opinions Towards Transportation Services
Bing Qi and Aaron Costin

13:30 Risk Identification and Assessment Methodology for Restoration Work of Unmanned Vehicle at Disaster Scene
Byeol Kim, Joo-Sung Lee, Jun Ueda, Yong K Cho, Chang-Soo Han and Yong-Han Ahn

13:45 Simulations for predicting the impacts of autonomous and connected vehicles on the transportation system: a review
Heung Jin Oh

14:00 Streaming sensor data validation in networked infrastructure systems through synergic auto and cross similarity discovery and analysis
Lu Xing, Amin Rasekh, M. Ehsan Shafiee, Lina Sela and Ami Preis

14:15 UAS-based Airport Maintenance Inspections: Lessons Learned from Pilot Study Implementation
Sungjin Kim, Daniel Paes, Kyuman Lee, Javier Irizarry and Eric Johnson

14:30 Optimization and Decision Making for Route Selection as an Alternative of Google Maps Considering Sustainability
Roya Amouhadi, Victor Veliz, Vahid Balali and Mehrdad Aliasgari

14:45 Data-Driven Dynamic Service Area Analysis: A Case Study with Taxi GPS data in Seoul, South Korea
Sung Bum Yun, Sungha Ju, Hyoungjoon Lim, Sangyoon Park and Joon Heo

[Session 3E] BIM, Ontologies and Semantic Approaches

Chair: Hubo Cai (Purdue University)

13:00 BIM-based Integrated Design Approach for Low Carbon Green Building Optimization and Sustainable Construction
Vincent J.L. Gan, Irene M.C. Lo, K.T. Tse, C.L. Wong, Jack C.P. Cheng and C.M. Chan

13:15 Designing a Database Schema for Supporting Visual Management of Variable Parameters in BIM Models
Wei-Liang Kuo, Han-Xiang Lee and Shang-Hsien Hsieh

13:30 Automated Parsing of Construction Schedules for Easy and Quick Assembly of 4D BIM Simulations
Wilfredo Torres Calderon, Yumo Chi, Mani Golparvar-Fard and Fouad Amer

13:45 Modeling 3D Spatial Constraints to Support Utility Compliance Checking
Xin Xu and Hubo Cai

14:00 A Bridge Information Modelling Framework for Model Interoperability
Yidong Qin, Rucheng Xiao, Yang Wang and Kincho Law

14:15 Cast-in-Place Reinforced Concrete Project Model Exchange Standards: Technology Challenges and Processes Automation
Leonardo Garcia and Daniel Castro-Lacouture

14:30 Holistic Clash Resolution Improvement Using Spatial Networks
Yuqing Hu, Daniel Castro and Charles Eastman

14:45 A semantic model for wireless sensor networks in cognitive buildings
Stalin Ibáñez, Kay Smarsly and Theresa Fitz

[Session5E] Built Environment and Infrastructure Monitoring, Assessment, and Maintenance

Chair: Joseph Louis (Oregon State University)

13:00 Investigating the Relationships of Socioeconomic Factors Delaying Post-Disaster Reconstruction
Behzad Rouhanizadeh and Sharareh Kermanshachi

13:15 The influence of building design, sensor placement, and occupant preferences on occupant centered lighting control
June Young Park and Zoltan Nagy

13:30 A Hybrid Information Fusion Method for Fusing Data Extracted from Inspection Reports for Supporting Bridge Data Analytics
Kaijian Liu and Nora El-Gohary

13:45 Opportunities for Applying Camera-Equipped Drones towards Performance Inspections of Building Facades
Kaiwen Chen, Georg Reichard and Xin Xu

14:00 A Computational Simulation-Based Comparison of Dual and Singular Water Distribution Infrastructure Systems
Kambiz Rasoulkhani, Ali Mostafavi and Sybil Sharvelle

14:15 Construction Equipment Activity Recognition from IMUs mounted on Articulated Implements and Supervised Classification
Khandakar M. Rashid and Joseph Louis

14:30 Assessing the effect of pavement distresses by means of LiDAR technologies
Maria Rosaria De Blasiis, Alessandro Di Benedetto, Margherita Fiani and Marco Garozzo

14:45 Investigating the Appliance Use Patterns on the Households Electricity Load Shapes from Smart Meters
Milad Afzalan and Farrokh Jazizadeh

[Session 6B] Human-technology Frontier

Chair: Fei Dai (West Virginia University)

13:00 Development of the Effective Communication Network in Construction Projects Using Structural Equation Modeling Technique
Elnaz Safapour and Sharareh Kermanshachi

13:15 Localizing Local Vulnerabilities in Urban Areas using Crowdsourced Visual Data from Participatory Sensing
Hongjo Kim, Youngjib Ham and Hyoungkwan Kim

13:30 Identifying A Ranking Method for Assessing the Potential Risk of Knee Musculoskeletal Disorders among Roofers in Shingle Installation
Amrita Dutta, Scott P. Breloff, Fei Dai, Erik W. Sinsel, Christopher M. Warren and John Z. Wu

13:45 Evaluating Generated Layouts in a Healthcare Departmental Adjacency Optimization Problem
Jennifer Lather, John Messner, Timothy Logan and Kate Renner

14:00 Human Comfort Aggregation Modeling based on Social Science Theory: Towards a Comfort-driven Cyber Human System Framework
Lu Zhang and Shankar Sanake

14:15 Prototype Development of a Tactile Sensing System for Improved Worker Safety Perception
Sayan Sakhakarmi, Jeewoong Park and Chunhee Cho

14:30 Robustness Analysis of Design Phase Performance Predictors Using Extreme Bounds Analysis (EBA)
Sharareh Kermanshachi and Behzad Rouhanizadeh

14:45 Biomechanical Analysis of Manual Material Handling Tasks on Scaffold
Srikanth Sagar Bangaru, Chao Wang and Fereydoun Aghazadeh

[Session 4C] Simulation and Process modeling

Chair: Dong Zhao (Michigan State University)

13:00 Path-Float Based Approach to Optimizing Time-Cost Tradeoff in Project Planning and Scheduling
Sasan Nasiri and Ming Lu

13:15 Dynamic Agent-Based Simulation of Information Transfer in Collaborative Project Network
Shaochong Gao, Xinyi Song and Ronggui Ding

13:30 Multi Agent-Based Model for Studying Electric Grid Transition to Distributed Energy Resources
Islam El-Adaway, Charles Sims, Mohamed Eid and Yinan Liu

13:45 Enhanced Simulations in Architectural and Engineering (A&E) Design Processes: A Data-Driven Approach
Yu Hou, Lucio Soibelman and Yan Jin

14:00 Evaluation of resequencing efforts to comply with installation sequences of prefabricated interior panels from bunks delivered on site
Yujin Lee, Martin Fischer and Jung In Kim

14:15 Agent-based Modeling Framework for Simulation of Societal Impacts of Infrastructure Service Disruptions during Disasters
Amir Esmalian, Maitreyi Ramaswamy, Ali Mostafavi and Kambiz Rasoulkhani

14:30 Mixed Pattern of Occupant Behavior and Appliance Use to Predict Home Energy Consumption
Yunjeong Mo, Dong Zhao and Matt Syal

15:00 – 15:15 **Break**

15:15 – 17:15 **Parallel Sessions**

[Session 1F] Resilient and Sustainable Urban and Energy Systems

Chair: Nan Li (Tsinghua University)

15:15 A Reinforcement Learning-based Stakeholder Value Aggregation Model for Collaborative Decision Making on Disaster Resilience
Lu Zhang, Xuan Lv and Sunil Dhakal

15:30 Sustainable Disaster Recovery Framework: Reducing the Community Vulnerabilities Throughout the Redevelopment Process
Mohamed S. Eid and Islam H. El-Adaway

15:45 Simulation of health and safety aspects during the maintenance of offshore wind farms
Philipp Kuenz, Lucian Ungureanu, Timo Hartmann and Thorsten Albers

16:00 Simulation of Network Dynamics in Inter-organizational Coordination and Resilience Planning of Interdependent Infrastructure Systems
Qingchun Li and Ali Mostafavi

16:15 Understanding the Demographic Representation of Social Signals in Crisis
Rachel Samuels and John Taylor

16:30 Identification of Principal Factors in Determining Building Peak Energy Shaving Capacities during Demand Response Events
Xinran Yu and Semiha Ergan

16:45 Measuring the Impact of Transportation Diversity on Disaster Resilience in Urban Communities: Case Study of Hurricane Harvey in Houston TX
Yan Wang, Armin Rahimi-Golkhandan, Changjie Chen, John Taylor and Michael Garvin

17:00 Quantifying Hospital Resilience to Earthquakes Based on System Dynamics Modeling
Zaishang Li, Nan Li, Gian Paolo Cimellaro and Dongping Fang

[Session 2F] Intelligent and Sustainable Transportation safety, Health monitoring, and Condition Assessment

Chair: Behzad Esmaeili (George Mason University)

15:15 Assessing the Relationship between Transportation Diversity and Road Network Congestion Using Participatory-Sensing Data
Armin Rahimi-Golkhandan, Farnaz Khaghani, Michael Garvin and Farrokh Jazizadeh

15:30 Development of Low-Cost Diagnostic System for Road Markings by using In-Vehicle Camera
Takumi Asada, Shuichi Kameyama and Shinichiro Kawabata

15:45 Accelerated Disaster Reconnaissance Using Automatic Traffic Sign Detection with UAV and AI
Yichang Tsai and Cheng Chieh Wei

16:00 Enhancing Sustainability of Rail Transit System by Applying Multi-agent System
Yida Guo, Cheng Zhang and Shaofeng Lu

16:15 Heterogeneous Network Flow Model for Optimized Restoration Planning of Interdependent Infrastructure System-of-Systems
Sudipta Chowdhury and Jin Zhu

16:30 Physics-driven based resilience analysis of interdependent civil infrastructure systems – A case study in Hong Kong
Yifan Yang, S. Thomas Ng, Shenghua Zhou, J Frank Xu and Hongyang Li

16:45 Application of Unsupervised Machine Learning to Increase Safety and Mobility on Roadways after Snowstorms
Pouya Gholizadeh, Curtis Walker, Mark Anderson and Behzad Esmaeili

[Session 3F] BIM, Ontologies and Semantic Approaches

Chair: Yong-Cheol Lee (Louisiana State University)

15:15 Entity-based MVD Concept Module Generation for Development of New BIM Data Exchange Standards
Yong-Cheol Lee, Pedram Ghannad, Moeid Shariatfar, Jiansong Zhang and Jin-Kook Lee

15:30 EXPLOITING MUSIC AND DANCE NOTATION TO IMPROVE VISUALIZATION OF BIM DATA
Marcel Broekmaat and Ioannis Brilakis

15:45 Worksite Object Characterization for Automatically Updating Building Information Models
Max Ferguson, Seongwoon Jeong and Kincho H. Law

16:00 Schema for Automated Generation of CLT Floor Framing and Panelization
Mehmet Bermek, Dennis Shelden and Russel Gentry

16:15 A routing-based emergency signage system automatically checking approach
Meiqing Fu and Rui Liu

16:30 Virtual Building Permitting Framework for the State of Florida
Mouloud Messaoudi, Nawari Nawari and Ravi Srinivasan

16:45 A technical review on developing BIM-oriented indoor route planning
Mun On Wong and Sanghoon Lee

17:00 Artificial Neural Network for Semantic Segmentation of Built Environments for Automated Scan2BIM
Yeritza Perez-Perez, Mani Golparvar-Fard and Khaled El-Rayes

[Session 4D] Human-technology Frontier

Chair: Wenying Ji (George Mason University)

15:15 Development of Effective Communication Framework Using Confirmatory Factor Analysis Technique
Thahomina Nipa, Sharareh Kermanshachi and Shirin Kamalirad

15:30 Understanding Different Views on Emerging Technology Acceptance between Academia and the AEC/FM Industry
Yong Cho, Youjin Jang, Kinam Kim, Fernanda Leite and Steven Ayer

15:45 Investigating the Neurophysiological Effect of Thermal Environment on Individuals' Performance Using Electroencephalogram
Xi Wang, Da Li, Carol Menassa and Vineet Kamat

16:00 Enhanced Welding Operator Quality Performance Measurement: Work Experience-Integrated Bayesian Prior Determination
Yitong Li, Wenying Ji and Simaan Abourizk

16:15 An Alternative Method for Monitoring Air Speed in Offices Using Miniature Sensors
Ashrant Aryal, Ishan Shah and Burcin Becerik-Gerber

16:30 Overview of supporting technologies for Cyber-Physical Systems Implementation in the AEC Industry
Daniel Antonio Linares Garcia, Nazila Roofigari-Esfahan and Chimay Anumba

16:45 Automatic Construction Specifications Review Using Natural Language Processing
Seonghyeon Moon, Gitaek Lee, Seokho Chi and Hyunchul Oh

17:00 Perceptions for Crane Operations
Xiao Bo, Keith Yin Kwong Lam, Jieyu Cui and Shih-Chung Kang

[Session 5F] Built Environment and Infrastructure Monitoring, Assessment, and Maintenance

Chair: Sharareh Kermanshachi (University of Texas, Arlington)

15:15 Vision-Model-based Real-time localization of unmanned aerial vehicle for autonomous structure inspection under GPS-denied environment
Zhexiong Shang and Zhigang Shen

15:30 Optimizing the socioeconomic benefit of post-disaster strategy by prioritizing reconstruction of damaged facilities
Pedram Ghannad, Yong-Cheol Lee, Carol Friedland and Eunhwa Yang

15:45 Identification, Categorization, and Weighting of Barriers to Timely Post-Disaster Recovery Process
Behzad Rouhanizadeh, Sharareh Kermanshachi and Thahomina Jahan Nipa

16:00 Information Requirements for Virtual Environments to Study Human-Building Interactions during Active Shooter Incidents
Runhe Zhu, Burcin Becerik-Gerber, Gale Lucas, Erroll Southers and David V. Pynadath

16:15 Precision Comparison of CNNs for Detection of Concrete Deterioration Types from Digital Images
Satoshi Anai, Nobuyoshi Yabuki and Tomohiro Fukuda

16:30 Planning and Monitoring of Building Energy Demands under Uncertainties by Using IoT Data
Soowon Chang, Daniel Castro-Lacouture, Kanae Matsui and Yoshiki Yamagata

16:45 Bridge Damage Prediction Using Deep Neural Networks
Soram Lim and Seokho Chi

17:00 Impact of Ground Subsidence on Groundwater Quality: A Case Study in Los Angeles, California
Mohammad Khorrami, Mohsen Hatami, Babak Alizadeh, Hedieh Khorrami, Peyman Rahgozar and Ian Flood

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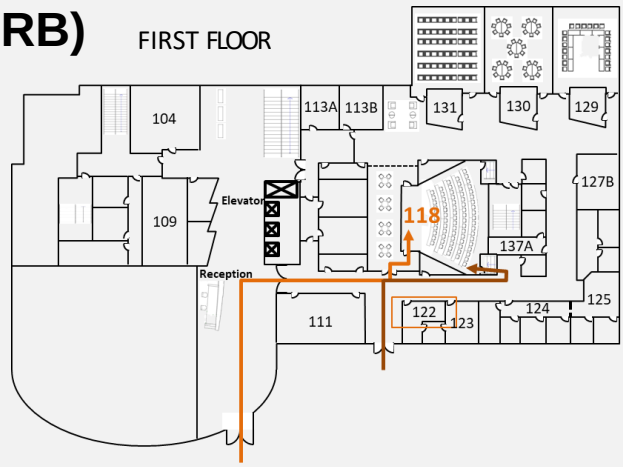
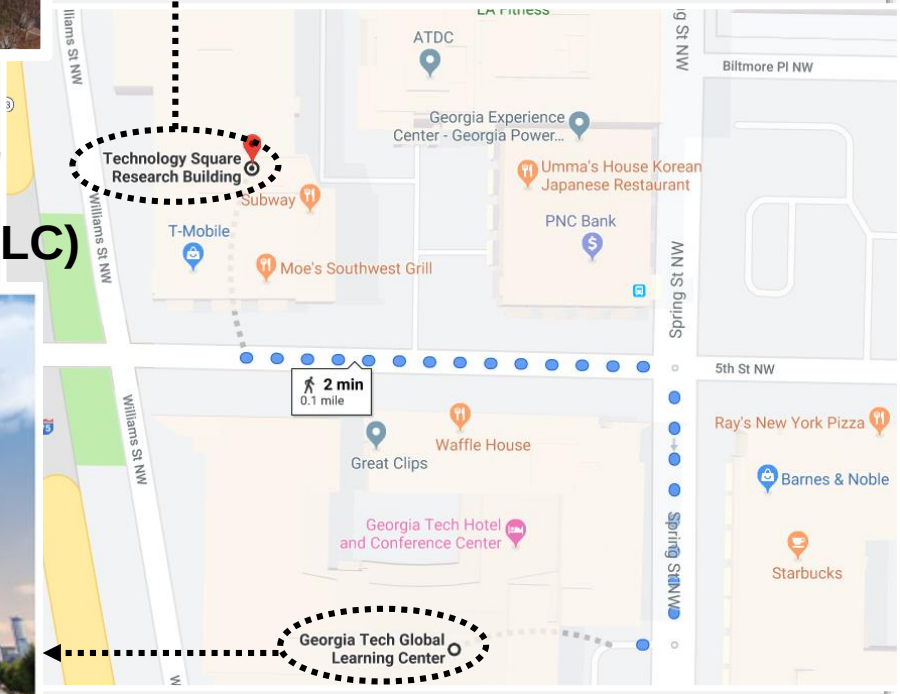
FIRST FLOOR





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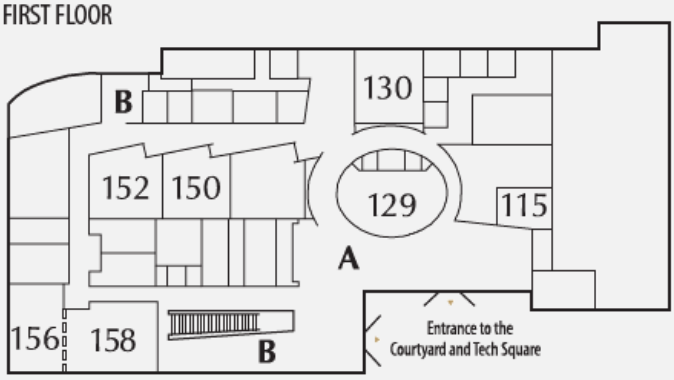

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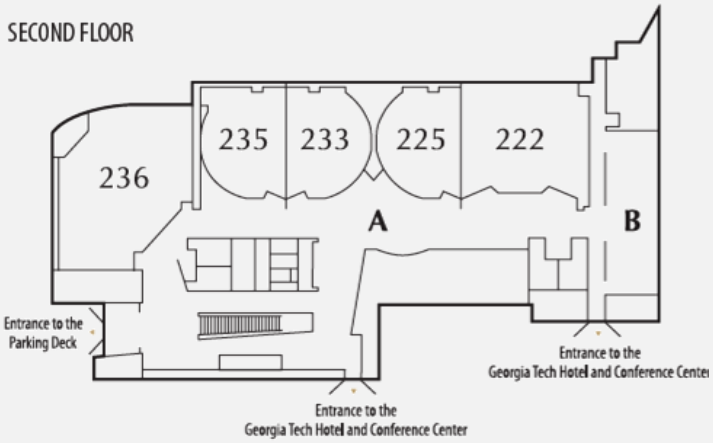

Contact: Kinam Kim (404-398-5446, kkim734@gatech.edu)