# Programme

ICCCBE //2022

| TUESDAY 25 OCTOBER 2022. 17:00 – 19:00: Registration and Welcome Function, GSB (V&A Waterfront) | | | |
|---|---|---|---|
| **WEDNESDAY 26 OCTOBER 2022** | | | |
| **Session** | **Venue A** | **Venue B** | **Venue C** |
| **1 (09:00 -10:00)** | **Conference Opening & KEYNOTE LECTURE** | | |
| Tea Break (10:00 – 10:30) | | | |
| **2 (10:30 - 12:30)** | **Big data, sensing, and machine learning I** | **Information modelling and Digital Twin Technology (BIM, BrIM, CIM, GIS) I** | **Structural engineering and materials modelling** |
| Lunch (12:30 -13:45) | | | |
| **3 (13:45 – 15:00)** | **Robotics, automation, and control** | **Information modelling and Digital Twin Technology (BIM, BrIM, CIM, GIS) II** | **Water and resource recovery modelling** |
| Tea break (15:00 – 15:30) | | | |
| **4 (15:30 – 16:30)** | **Big data, sensing, and machine learning II** | **Reality capture technologies (LIDAR, RGB-D, vision)** | |
| **THURSDAY 27 OCTOBER 2022** | | | |
| **5 (8:30 - 10:00)** | **KEYNOTE LECTURES** | | |
| Tea break (10:00 – 10:30) | | | |
| **6 (10:30 - 12:30)** | **Information modelling and Digital Twin Technology (BIM, BrIM, CIM, GIS) III** | **Asset and facility management, operation, and maintenance** | **Various** |
| Lunch (12:30 -13:45) | | | |
| **7 (13:45 - 15:00)** | **Digital Twin Construction I** | **Visualization (nD,VR, AR)** | **Various** |
| Tea break (15:00 – 15:30) | | | |
| **8 (15:30 - 16:30)** | **Digital Twin Construction II** | **Resilient and sustainable urban and energy systems** | **Information and communication technologies (IoT, crowdsourcing, social networks)** |
| **Conference Dinner 19:00** | | | |
| **FRIDAY 28 OCTOBER 2022** | | | |
| **9 (8:30 – 10:00)** | **KEYNOTE LECTURES** | | |
| Tea break (10:00 – 10:30) | | | |
| **10 (10:30 - 12:30)** | **Project design, construction, planning, and management** | **Space Partitions: An alternative to domain assembly in geometric modelling** | |
| Lunch (12:30 -13:45) | | | |
| **11 (13:45 - 15:00)** | **Big data, sensing, and machine learning III** | **Built environment monitoring, control, analysis and design** | |
| Tea break (15:00 – 15:30) | | | |
| **SAICE Award: Best student presentation / Closing Function 15:30 - 16:30** | | | |

# WEDNESDAY 26 OCTOBER 2022

**Session 1 (09:00 -10:00)** (Venue A)

**Conference Opening:** *Sebastian Skatulla, Hans Beushausen, Marianne Vanderschuren (SAICE President)*

**KEYNOTE LECTURE** [Chair: Sebastian Skatulla]

**Stimulating digital transformation in the construction industry**
*Abimbola Windapo*

**Tea Break (10:00 – 10:30)**

**Session 2 (10:30 – 12:30)** [Chairs: Elham Mahmoudi (A), Adel Francis (B), Uwe Rüppel (C)]

| Big data, sensing, and machine learning I | Information modelling and Digital Twin Technology (BIM, BrIM, CIM, GIS) | Structural engineering and materials modelling |
|---|---|---|
| **An alternative approach to automated code checking – application of Graph Neural Networks for an accessibly check case study**<br>*Tanya Bloch; André Borrmann; Pieter Pauwels*<br><br>**Image segmentation on concrete damage for augmented reality supported inspection tasks**<br>*Firdes Celik; Patrick Herbers; Markus König*<br><br>**Requirements of machine learning and semantic enrichment for BIM-based automated code compliance checking: a focus group study**<br>*Ankan Karmakar; Venkata Santosh Kumar Delhi*<br><br>**A Novel deep learning model to digitize 2D Architectural or Engineering sketches to DWG files**<br>*Christopher Dzuwa; Innocent Musonda; Adetayo Onososen; German Nkhonjera*<br><br>**Identifying non-revenue water hotspots in distribution systems using machine learning**<br>*Christopher Dzuwa; Innocent Musonda; Adetayo Onososen; German Nkhonjera*<br><br>**Blockchain technology as a monitoring tool for sensor data**<br>*Jascha Brötzmann; Jyotiraditya Panda; Uwe Rüppel*<br><br>**Worker Activity Classification using Multimodal Data Fusion from Wearable Sensors**<br>*Yunfeng Chen; Chi Tian; Yiheng Feng; Jiansong Zhang* | **How many D's are there in BIM? Smart Built Environment Engineering (SBEE) Immersive Modelling Taxonomy**<br>*Andrey Volkov*<br><br>**Achieving macro-level BIM diffusion: a critical study of profound constraints and key stakeholders in South Africa**<br>*Samuel Adeniyi Adekunle; Obuks Ejohwomu; Clinton Aigbavboa; Matthew Ikuabe; Babatunde Ogunbayo; Ini Beauty John*<br><br>**Digital building twin with thermographic information – identification of energy weaknesses for existing buildings**<br>*Thomas Kress; Jürgen Melzner*<br><br>**Measuring the data continuity of BIM models from a design project**<br>*Suhyung Jang; Ghang Lee*<br><br>**Development of knowledge information model for highway route design**<br>*Koji Makanae*<br><br>**Ontology-based computerized expression method for BIM model quality standards**<br>*Ma Zhiliang; Xiang Xinglei; Zhou Junyu*<br><br>**Ontology-based construction process library for process states inference**<br>*Yuan Zheng; Olli Seppänen; Mustafa Khalid Masood; Seppo Törmä*<br><br>**Precise documentation technique of heritage structures to facilitate strategies for conservation of heritage cultural sites in India**<br>*Samarjeet Salunke* | **Data and Model-based Metamodels for Prediction of Performance of Extended Hollo-Bolt Connections**<br>*Manuela Cabrera; Jelena Ninic; Walid Tizani; Fangying Wang*<br><br>**Structural Performance of Metal Sheeting versus Tiled Roofs under Extreme Winds**<br>*Marc Lukusa Tshimpumpu; Abdolhossein Naghizadeh; Jeffrey Mahachi*<br><br>**Heat Transfer through a sandwich ceiling system**<br>*Palesa J Mnanzana; J Combrinck*<br><br>**Artificially Intelligent Classification of Structural Plans for Automated Schematic Design of Reinforced Concrete Structures**<br>*Alon David Argaman; Rafael Sacks*<br><br>**BIM modelling of steel structures**<br>*Ángel Herrero Castaño; Amaya Gómez Yábar; Benjamin Gonzalez Canto; Jaime Sempere Ontenient*<br><br>**Experimental testing and numerical modelling of heat transfer through a composite sandwich flooring system with penetrations exposed to fire**<br>*Palesa Mnanzana; J Combrinck;GG Jacobs; RS Walls* |

**Lunch (12:30 -13:45)**

| **Session 3 (13:45 -15:00)** [Chairs: Christian Koch (A), Clinton Aigbavbo (B), Andrey A. Volkov (C)] | | |
|---|---|---|
| **Robotics, automation, and control** | **Information modelling and Digital Twin Technology (BIM, BrIM, CIM, GIS) II** | **Water and resource recovery modelling** |
| **Development of a Safe and Anthropomorphic Drone in an Interdisciplinary Research-Oriented Construction Management Course**<br>*Gilles Albeaino; Masoud Gheisari; Raja R.A. Issa*<br><br>**Safety Implications of Human-robot interaction in industrialised Construction Sites: An Ethical Perspective**<br>*Adetayo Onososen; Innocent Musonda; Ramabodu Molusiwar*<br><br>**Feasibility of an Automated Inspection Process Adoption for Quality Housing Delivery in South Africa**<br>*Tholang David Nena; Innocent Musonda; Chioma Okoro*<br><br>**Bottlenecks to the implementation of automation and robotics in the construction industry**<br>*Ayanda Boya; Opeoluwa Akinradewo; Clinton Aigbavboa; Molusiwa Ramabodu; Andrew Ebekozien* | **Graph-based similarity analysis between topologic-geometric building designs and segmented synthetic point clouds**<br>*Fiona Claire Collins; Alexander Braun; André Borrmann*<br><br>**The IFC-Tunnel project - extending the IFC standard to enable high-quality exchange of tunnel information models**<br>*André Borrmann; Michel Rives; Lars Wikström; Sergej Muhic*<br><br>**Achieving macro-level BIM diffusion: a critical study of profound barriers in South Africa**<br>*Samuel Adeniyi Adekunle; Obuks Ejohwomu; Clinton Aigbavboa; Matthew Ikuabe; Babatunde Ogunbayo; Ini Beauty John*<br><br>**Fusing MODIS and VIIRS datasets for natural fire monitoring**<br>*Thembani Moyo; Innocent Musonda* | **Water and resource recovery modelling: development of an application for groundwater management framework for Jukskei River catchment of South Africa**<br>*Daphine Achiro; Dr. Rebecca Alowo; German Nkhonjera*<br><br>**A modelling framework for groundwater sustainability in the Upper Orange catchment of South Africa**<br>*Rebecca Alowo*<br><br>**Comparing object detection models for water trash monitoring**<br>*Seokhwan Kim; Jeongho Hyeon; Taegeon Kim; Jonghwa Won* |
| **Tea Break (15:00 – 15:30)** | | |
| **Session 4 (15:30 – 16:30)** [Chairs: André Borrmann (A), Nobuyoshi Yabuki (B)] | | |
| **Big data, sensing, and machine learning II** | **Reality capture technologies (LIDAR, RGB-D, vision)** | |
| **Residential envelope energy efficient design exploration using generative design**<br>*Rita Elias; Raja R.A. Issa*<br><br>**Machine learning algorithm for the construction industry: a literature review**<br>*Samuel Adeniyi Adekunle; Onatayo Damilola A.; Obinna C. Madubuike; Clinton Aigbavboa; Obuks Ejohwomu*<br><br>**Generating pseudo label of object detector based on moving features**<br>*Taegeon Kim; Giwon Shin; Seokhwan Kim; Hongjo Kim*<br><br>**Context-aware PPE compliance check in far-field monitoring**<br>*Wei-Chih Chern; Jeongho Hyeon; Tam V. Nguyen; Vijayan K. Asari; Hongjo Kim* | **Inspection challenges during housing construction in Gauteng, South Africa**<br>*Tholang David Nena; Innocent Musonda; Chioma Okoro*<br><br>**Multicriterial Scan Planning in Complex 3D Environments** *Florian Noichl; André Borrmann*<br><br>**Scan-for-BIM: cost-effective data survey for mobile mapping systems**<br>*Lucía Díaz-Vilariño* | |

# THURSDAY 27 OCTOBER 2022

**Session 5 (8:30 -10:00) KEYNOTE LECTURES** [Chair: Uwe Rüppel]

**Digital Twins for Smart Decision Making**
*Raymond Issa*

**Tying the surface to the subsurface -- an emerging paradigm shift in Digital Twins**
*Debra Laefer*

**The impact of the adoption of ISO19650 as a National Standard covering information management throughout the built assets and infrastructure life cycle**
*Rudd van Deventer*

**Tea Break (10:00 – 10:30)**

**Session 6 (10:30 – 12:30)** [Chairs: Abimbola Windapo (A), Alireza Moghayedi (B), Georg Suter (C)]

| Information modelling and Digital Twin Technology (BIM, BrIM, CIM, GIS) | Asset and facility management, operation, and maintenance | Various |
|---|---|---|
| **A critical review of measuring the productivity of building information modelling**<br>*Sanghyun Shin; Ghang Lee*<br><br>**Using Digital Twin to facilitate and automate green building assessments**<br>*Amos Darko; T.A.D.K. Jayasanka; Albert P.C. Chan; Farzad Jalaei*<br><br>**A framework for anomaly detection from structural building information models using a graph neural network**<br>*Minkyeong Park; Kahyun Jeon; Ghang Lee*<br><br>**Digital Twinning in Additive Manufacturing – Closing the digital-physical-digital loop by automated integration of captured geometric data into fabrication information models**<br>*Martin Slepicka; Karam Mawas; André Borrmann; Mehdi Maboudi; Markus Gerke*<br><br>**Digital Twin technology as a paradigm for smart management in the built environment**<br>*Olushola Akinshipe; Clinton Aigbavboa; Chimay Anumba*<br><br>**Opportunities in BIM-Industry 4.0**<br>*Chika Okafor; Clinton Aigbavboa; Eziyi Ibem*<br><br>**Construction and Modification of Topological Tables for Digital Models of Linear Complexes**<br>*Aleksandr Rozhkov; Vera Galishnikova*<br><br>**Building Information Modelling in Healthcare Design and Construction: a Bibliometric Review and Systematic Review**<br>*Tan Tan; Grant Mills; Eleni Papadonikolaki; Yue Xu; Ke Chen* | **Technological innovation for improving energy and water consumption efficiency and sustainability on government buildings in South Africa: a comprehensive review of literature**<br>*Evans Magaisa; Kathy Michell; Alireza Moghayedi*<br><br>**Leveraging AI and IoT for improved management of educational buildings**<br>*Ashvin Manga; Chris James Allen*<br><br>**Comparing road crack segmentation performance between CNN and transformer-based architecture in participatory monitoring**<br>*Jeongho Hyeon; Giwon Shin; Taegeon Kim; Hongjo Kim; Hongjo Kim*<br><br>**Factors affecting maintenance management of public buildings in South Africa**<br>*Morena William Nkomo; Letsau Khutso Maphutha; Molusiwa Stephan Ramabodu*<br><br>**Embedding RFID Tags into Precast Structural Components for Tracking and Holistic Real-Time Lean Construction Management**<br>*Abduaziz Juraboev* | **Integrating AEC domain-specific disciplinary knowledge at early design stage for informed immediate feedback and interactive design**<br>*Julia Reisinger; Iva Kovacic; Shervin Rasoulzadeh; Michael Hensel*<br><br>**Optimization of the transportation plan of designated radioactive waste using quantum annealing**<br>*Nobuyoshi Yabuki; Junya Makino; Tomohiro Fukuda*<br><br>**Proposal of a collaborative education model for AEC supported by the Additive Manufacturing use**<br>*Márcio Henrique de Sousa Carboni; Sérgio Scheer; Armando Luis Yoshio Ito*<br><br>**The integration of 4IR technologies in architectural education for upskilling the workforce in the Nigerian built environment**<br>*Chika Okafor; Clinton Aigbavboa; John Aliu; Ornella Tanga*<br><br>**Unpacking the relation between digital transformation and sustainability**<br>*Eleni Papadonikolaki; Chimay J. Anumba*<br><br>**Instance segmentation for fire safety equipment detection in RGB images**<br>*Angelina Aziz; Markus König; Sven Zentgraf; Jens-Uwe Schulz*<br><br>**Comparative application of digital image processing and kuz-ram model in blast fragmentation analysis: case of Shayona Cement Quarry**<br>*Jabulani Matsimbe; Martin Shaba; Innocent Musonda; Megersa Dinka* |

**Lunch (12:30 -13:45)**

**Session 7 (13:45 -15:00)** [Chairs: Rafael Sacks / Timson Yeung (A), Koji Makanae (B), Sergio Scheer (C)]

| Digital Twin Construction I | Visualization (nD,VR, AR) | Various |
|---|---|---|
| **Towards a Digital Twin system design based on a user-centered approach to improve quality control on construction sites**<br>*DELVAL; Mehdi; Mélanie*<br><br>**Industry 4.0-based digital twin approach for construction site tracking purposes**<br>*Simon Kosse; Dennis Pawlowski; Markus König*<br><br>**Automatically quantifying movement of prefabricated building components on site for a Location-Based Management System: an ecosystem for Digital Twin construction**<br>*Fabiano Rogerio Correa; Alex Roda Maciel; Sergio Scheer*<br><br>**Automatic parametric generation of simulation models from project information in Digital Twin Construction**<br>*Timson Yeung; Jhonattan Martinez; Li-or Sharoni; Jorge Leao; Rafael Sacks* | **Interactive BIM-based VR: A case study of doors**<br>*CHEN SOU HAN; Dr. XUE, Fan*<br><br>**Real time inference of temporal emotional and behavioural conditions of learners in problem solving within mixed reality environments**<br>*Edouard Cassets; Ivan Mutis; Gady Agam*<br><br>**Concept and implementation of BIM-to-World registration for mixed reality applications**<br>*Christian Koch; Marat Khairtdivov; Fulya Tasliarmut*<br><br>**Leveraging virtual reality for improved construction health and safety training**<br>*Damien Smuts; Ashvin Manga; John Smallwood* | **Blockchain technologies and building/city information modelling: a conceptual framework to facilitate urban asset management using distributed ledger technology**<br>*Oluwatoyin O. Lawal; Nawari O. Nawari,*<br><br>**A State-of-the-Art Review on blockchain and trust in construction project Governance**<br>*Seongha Hwang; Mingzhu Wang; Mohamed Osmani; Karen Blay*<br><br>**Simple techniques to improve solar panel efficiency using MPPT**<br>*Andile Mathlane Ramatsoma; E. Bakaya-Kyahurwa*<br><br>**Exploring digitisation as a solution to the long-term insurance sector efficiency quagmire**<br>*Linda Malifete; Samuel Adeniyi Adekunle; Clinton Aigbavboa* |

**Tea Break (15:00 – 15:30)**

**Session 8 (15:30 – 16:30)** [Chairs: Rafael Sacks / Timson Yeung (A), Chris James Allen (B), Alireza Moghayedi (C)]

| Digital Twin Construction II | Resilient and sustainable urban and energy systems | Information and communication technologies (IoT, crowdsourcing, social networks) |
|---|---|---|
| **AEC Digital Twin platforms – why (data) structure matters**<br>*André Borrmann; Jonas Schlenger; Nicolas Bus; Rafael Sacks*<br><br>**Financial digital twin: benefits of increased collaboration between investors and owners**<br>*Kwandokuhle M. Lynch; Raja R.A. Issa; Chimay Anumba*<br><br>**Requirements management for flow production of precast concrete elements**<br>*Simon Kosse; Oliver Vogt; Mario Wolf; Markus König; Detlef Gerhard*<br><br>**Digital Twin-based automated green building assessment framework**<br>*Amos Darko; T.A.D.K. Jayasanka; Albert P.C. Chan; Farzad Jalaei; Mark Kyeredey Ansah; De-Graft Joe Opoku* | **Benefits and Drivers of Emerging Smart Solutions for Energy Efficiency in the Construction Industry**<br>*Olusegun A Oguntona; Clinton O Aigbavboa; Fikile M Ngobeni*<br><br>**Challenges for the Implementation of Sustainable Construction Practices in Developing Countries: A Bibliometric Review**<br>*Motheo Meta Tjebane; Innocent Musonda; Adetayo Onososen*<br><br>**A Review of Smart City Maturity Assessment Models and Performance Monitoring Mechanisms**<br>*Pavan Kumar; Aritra Pal; Shang-Hsien Hsieh* | **An assessment of emerging technologies in the architecture, engineering and construction industry**<br>*Olusegun Aanuoluwapo Oguntona; Clinton Aigbavboa; Malebese Mautlane*<br><br>**Unravelling the state of the art of Blockchain development for improved infrastructure delivery in the Built environment: A Bibliometric Review**<br>*Motheo Meta Tjebane; Innocent Musonda; Adetayo Onososen*<br><br>**The potential benefits of using e-tendering in South African construction projects**<br>*Morena William Nkomo; Lincoln Hlungwane; Molusiwa Stephan Ramabodu; Emmanuel Emem - Obong Agbenyeku* |

**Conference dinner 19:00: GOLD Restaurant, Green Point**

# FRIDAY 28 OCTOBER 2022

**Session 9 (8:30 -10:00) KEYNOTE LECTURES** [Chair: Adel Francis]

**The role of technological innovation on the sustainability of civil and infrastructure projects**
*Kathy Michell*

**How we predict energy use in buildings needs more precise modelling methods**
*Nashwan Dawood*

**Technology in Green Buildings: balancing high tech & low tech**
*Manfred Braune*

**Tea Break (10:00 – 10:30)**

**Session 10 (10:30 – 12:30)** [Chairs: Rudd Deventer (A), Christian Clemen (B)]

| Project design, construction, planning, and management | Space Partitions: An alternative to domain assembly in geometric modelling | |
|---|---|---|
| **Modelling building wall systems using a spatiotemporal chronographical scheduling**<br>*Adel Francis; Edmond Miresco*<br><br>**Towards increased situational awareness at unstructured work zones: Analysis of response data captured in VR based micro traffic simulations**<br>*Julia Qin; Daniel Lu; Semiha Ergan*<br><br>**Human-technology interaction in the built environment: a review of implications on \"sense of place\" and mental health**<br>*Adetayo Onososen; Innocent Musonda; Christopher Dzuwa; Motheo Meta Tjebane*<br><br>**Sustainable material selection in construction projects: a systematic literature review**<br>*Haney Basak Daşkın; Emre Caner Akçay*<br><br>**Organisational leadership as a driver for the adoption of digital technologies for construction project delivery**<br>*Matthew Ikuabe; Clinton Aigbavboa; Samuel Adekunle; Babatunde Ogunbayo; Rotshidzwa Mugaga* | **Space Partitioning as a Holistic Alternative to Traditional Geometric Modeling Workflows in the AEC Industry**<br>*Wolfgang Huhnt; Joanna Zarah Vetter; Maximilian Sternal*<br><br>**A computational robust method for spatial decomposition - Test study with cadastral data**<br>*Enrico Romanschek; Christian Clemen; Wolfgang Huhnt*<br><br>**Transforming Building Components into a Space Partition to Identify Indoor and Outdoor Spaces in Digital Building Models**<br>*Joanna Zarah Vetter; Wolfgang Huhnt*<br><br>**Where is the end of the wall: decomposition of air and matter into spaces and building components**<br>*Felix Gabler; Wolfgang Huhnt*<br><br>**Robust Modeling of Polyhedral Space Partitions**<br>*Maximilian Sternal; Wolfgang Huhnt*<br><br>**A method for convex decomposition of architectural space volumes**<br>*Georg Suter*<br><br>**An approach for fire and smoke compartmentation using the IFC-structure**<br>*Janna Walter; Joaquín Díaz* | |

**Lunch (12:30 -13:45)**

| **Session 11 (13:45 -15:00)** [Chairs: Molusiwa Ramabodu (A), Jaime Sempere (B)] | | |
|---|---|---|
| **Big data, sensing, and machine learning III** | **Built environment monitoring, control, analysis and design** | |
| **Extracting Information from Old and Scanned Engineering Drawings of Existing Buildings for the Creation of Digital Twins**<br>*Tariq Al-Wesabi; Andreas Bach; Phillip Schönfelder; Inri Staka; Markus König*<br><br>**Various machine learning for detecting anomalies in time series data from a tunneling project**<br>*Elham Mahmoudi; Keyur Joshi*<br><br>**Revisiting influence factors for the retaining wall systems selection**<br>*Hyunsung Roh; Ghang Lee*<br><br>**Segmentation tool for images of fatigue cracks in steel bridges**<br>*Andrii Kompanets; Remco Duits; Davide Leonetti; Nicky van den Berg; H. H. (Bert) Snijder*<br><br>**Modelling sustainable transportation systems by applying supervised machine learning techniques**<br>*Thembani Moyo; Innocent Musonda* | **An approach for automated energy simulations at neighbourhood level on the example of UBC Vancouver Campus for targeted energy retrofitting**<br>*Christian-Dominik Thiele; Uwe Rüppel*<br><br>**Drivers of machine learning applications in the construction industry of developing economies**<br>*Matthew Ikuabe; Clinton Aigbavboa; Ayodeji Oke; Wellington Thwala; Joseph Balogun*<br><br>**Smart City Type C: Civil Superculture** Omni-Parametric Environment (CSCOPE)<br>*Andrey Volkov*<br><br>**Lumped Approach to Recognize Types of Construction Defect from Text with Hand-drawn Circles**<br>*Seungah Suh; Ghang Lee; Daeyoung Gil* | |
| Tea Break (15:00 – 15:30) | | |
| **SAICE Award: Best student presentation** | | |
| **Closing Function 15:30 - 16:30** | | |


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