GEORG NEMETSCHEK INSTITUTE

TUM VENTURE LABS

TUM

Georg Nemetschek Institute Symposium & Expo

10th - 12th September 2024

Artificial Intelligence for the Built World

From basic research to industrial application and back

Supported by

NEMETSCHEK INNOVATIONSSTIFTUNG

NEMETSCHEK GROUP

baiosphere the bavarian ai network

BAU

BE FIVE

PROGRAM

GNI SYMPOSIUM & EXPO: ARTIFICIAL INTELLIGENCE FOR THE BUILT WORLD
SEPTEMBER, 10 – 12, 2024

Tuesday

UNDERSTAND AI
>> FOCUS RESEARCH

08:30 Registration & Coffee

09:00 Opening Ceremony — FREE ACCESS

Welcome Address
Prof. Dr. Thomas F. Hofmann, President TUM
Prof. Georg Nemetschek, Honorary Senator
Yves Padrines, CEO Nemetschek Group
Prof. Dr. Christoph Gehlen, Dean TUM SoED
Christian Bernreiter (recorded), Bavarian State Minister for Housing, Construction and Transport

Opening Keynote
How Human-Centric AI Shapes the Built World
Prof. Dr. Burcin Becerik-Gerber
University of Southern California (USC)

10:30 Coffee Break

11:00 Paper Session 1
Digital Twins & AI

12:30 Lunch & Networking Break

13:30 Research Keynote
BIMKIT - An AI ecosystem for generating as-built models for buildings and infrastructure
Prof. Dr. Markus König, Ruhr University Bochum

14:00 Paper Session 2
AI-Based Decision Support

15:30 Coffee Break

16:00 Paper Session 3
Natural Language Processing & Remote Perception

17:30 Industry Session
Intro by Dr. Michael Klimke, baiosphere

Artificial Intelligence at Work
Prof. Dr. Burcin Becerik-Gerber, USC
Matthias Zühlke, syte
Michael Gisdol, Bayrische Hausbau
Furio Sordini, Implenia
Yashar Moradi, MOD

18:30 Recap and Closing
18:45 Network & Reception

Wednesday

ENVISION AI
>> FOCUS RESEARCH & INDUSTRY

08:00 Registration & Coffee

08:30 Research Keynote
Towards Physics-Informed Cities: Digital Twins
Prof. Francisco Chinesta,
Arts et Métiers Institute of Technology (Paris)

09:00 Paper Session 4
Physics-Informed AI

10:30 Coffee Break

11:00 Paper Session 5
Building Energy & Environment

12:30 Lunch & Networking Break

13:30 Paper Session 6
Infrastructure Planning and Maintenance

15:00 Coffee Break

15:30 Industry Keynote
From Lab to Market: Integration of AI Research into Real-World Applications
Dr. Angelika Kneidl, accu:rate

16:00 Industry Keynote
Responsible and sustainable AI within the AECO
Marc Nézet, Nemetschek Group

16:30 Discussion
Dr. Angelika Kneidl, accurate
Mark Nézet, Nemetschek Group
Dr. Philipp Gerbert, TUM Venture Labs

17:00 Networking Break

17:30 Industry Session
AI-enhanced Design & Construction
Dr. Julia Reisinger, factorymaker
Clemens Lindner, Zaha Hadid Architects
Christoph Geiger, Zaha Hadid Architects
Stephan Lüttger, Max Bögl

18:30 Recap and Closing
19:30 Conference Dinner

Thursday

EXPERIENCE AI
>> FOCUS INDUSTRY & STARTUPS

08:00 Registration & Coffee

08:30 Industry Keynote
Creating value with AI: How to professionally apply AI
Dr. Andreas Liebl, applied AI

09:00 Industry Keynote
Real World Data as the Catalyst: Transformative Advances in AI
Dr. Matthias Standfest, Drees&Sommer

09:30 Research Keynote
AI in the Built Environment: The Application-Driven Perspective
Prof. Dr. André Borrmann, TUM

10:00 Discussion
Dr. Andreas Liebl, applied AI
Dr. Matthias Standfest, Drees&Sommer
Prof. Dr. André Borrmann, TUM

10:30 Coffee Break

11:00 Start-Up Pitch Session
moderated by Artem Kuchukov, KEWAZO

Spacio.ai
Twinovia
Factorymaker
Zenesis
Monco.ai
Alago.ai
Focused.ai
ESG-X
EMIDAT

12:30 Lunch & Networking Break

13:30 Paper Session 7
Semantic Model Generation

15:00 Coffee Break

15:30 Award Ceremony
Best paper and start-up award

16:00 Recap & Closing
16:30 Farewell & Drinks

TUM Georg Nemetschek Institute

A flagship centre for academic research, teaching and knowledge transfer to society.

Research fields include artificial intelligence, machine learning, data-centred engineering and related data and knowledge-based technologies. We concentrate on applications in architecture, engineering, construction, operate & management in the built environment (AECOM). The Institute thus develops and promotes a new generation of technologies with strategic importance for digital sciences in general and AECOM industries in particular. It contributes to solving the grand societal challenges of the environment, climate, information & communications, mobility & infrastructure. Taking advantage of big data, extracting information by data analytics, creating insight from machine learning as well as representing and reasoning with knowledge, „AI for the Built World“ focuses on the creation of efficient technologies for supporting important aspects of AECOM decision-making.

Founded in 2021, the institute is funded through the generous donation by the Nemetschek Innovation Foundation.

Symposium & Expo 2024

We welcome you to a unique conference where academic researchers will meet on an equal platform with representatives from small and large companies, including start-ups, to discuss opportunities and risks in a field that is growing exponentially:

AI for the built world.

What algorithms and representations work at full scale? What do the stakeholders in the built world want? What do they not yet know they will want? Should software provide choices rather than answers? What is destined to fail? There is a lot to discuss, many more questions and many more potential solutions.

Taking place at one of Germany‘s largest centers for science, education, and entrepreneurship, the High-Tech Campus Garching is the largest campus of the Technical University of Munich. All symposium venues are conveniently accessible through Munich’s public transportation network, which includes buses, trams, the U-Bahn (subway), and the S-Bahn (suburban trains). Detailed information on transportation zones, tickets, tariffs, and maps can be found on the MVV and MVG websites and apps.

Event Partners

TUM Georg Nemetschek Institute

TUM has founded the TUM Georg Nemetschek Institute Artificial Intelligence for the Built World to conduct research on future-oriented computer technologies, Artificial Intelligence (AI), and Machine Learning. It is closely associated with the Munich Data Science Institute (MDSI) and the Leonhard-Obermeyer-Center (LOC).

TUM Venture Labs

TUM Venture Labs transform deep-tech and life-sciences ideas into scalable businesses by supporting students, researchers and startups from idea generation to seed capital. They offer domain-specific support and promote cross-fertilization of leading-edge methods and technologies. Based in Munich, the Labs leverage their impact nationally and internationally through europa's most successful start-up ecosystem.

Supporters

Nemetschek Innovationsstiftung

The mission of the NEMETSCHEK Innovation Foundation is to support non-profit research institutions and organisations around the world in developing innovations for the analysis, design, construction and use of buildings and to make them usable in practice.

Nemetschek Group

The Nemetschek Group is a forerunner of digital transformation in the AEC/O industry and covers the entire life cycle of construction and infrastructure projects. With intelligent software solutions, they lead their customers into the future of digitalization.

BEFIVE by UnternehmerTUM

BEFIVE by UnternehmerTUM is an innovation and digitalization platform focused on advancing the entire lifecycle of buildings and infrastructure, from planning to deconstruction. It brings together established companies, startups, talent, and stakeholders to implement cutting-edge digital solutions. BEFIVE addresses the challenges of digital transformation in the construction sector, helping to drive industry-wide change.

baiosphere - the bavarian AI network

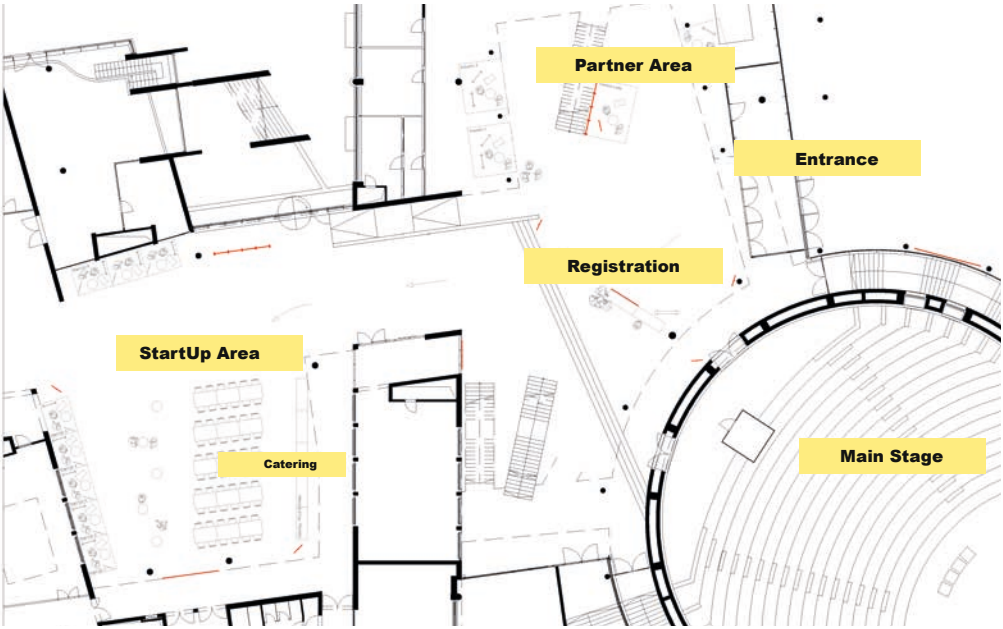
The Bavarian AI agency strengthens Bavaria's AI network through a world-class technology ecosystem led by top researchers and industry leaders. Supported by the Bavarian State Government's Hightech Agenda, it features over 100 AI professorships and four key research hubs in Intelligent Robotics, Data Science, Health, and Mobility.

BAU by Messe München

BAU is the world's leading trade fair for architecture, materials, and systems, held biennially, where professionals from planning, building, and design industries gather. It facilitates high-level knowledge exchange, fosters investment decisions, and opens international market opportunities for exhibitors and visitors.

Blending academia and industry to create a trustworthy future of AI for the built world.

Venue



Symposium

Department of
Mechanical Engineering
Lecture Hall 0001
Boltzmannstr. 15
85748 Garching

Expo-Area

Department of
Mechanical Engineering
Magistrale with court 1
and court 2 outside of
the main auditorium.

Conference Dinner

Gasthof Neuwirt
www.gasthof-neuwirt.org

Münchener Str.10
85748 Garching

Research Keynotes

Tuesday, 10.09.2024 // 10:00 - 10:30

How Human-Centric AI Shapes the Built World

Prof. Dr. Burcin Becerik-Gerber
University of Southern California
Chair of Sonny Astani
Department of Civil and Environmental Engineering

Tuesday, 10.09.2024 // 13:30 - 14:00

BIMKIT - An AI ecosystem for generating as-built models for buildings and infrastructure

Prof. Dr. Markus König
Ruhr-University Bochum
Chair of Computing in Engineering
Department of Civil and Environmental Engineering

Wednesday 11.09.2024 // 08:30 - 09:00

Towards Physics-Informed Cities: Digital Twins

Prof. Francisco Chinesta
Arts et Métiers Institute of Technology
Director of ESI's scientific department

Thursday 12.09.2024 // 09:30 - 10:00

AI in the Built Environment: The Application-Driven Perspective

Prof. Dr. André Borrmann
Technical University of Munich
TUM School of Engineering and Design

Followed by a Keynote Discussion from 10:00 to 10:30 am moderated by Tobias Förtsch and Dr. Christos Chantzaras

Industry Keynotes

Wednesday, 11.09.2024 // 15:30 - 16:00

From Lab to Market: Integration of AI Research into Real-World Applications

Dr. Angelika Kneidl
Founder and CEO
accu:rate GmbH

Wednesday, 11.09.2024 // 16:00 - 16:30

Responsible and sustainable AI: Ethics, trust, and sustainability are essential dimensions to develop and deploy AI responsibly within the AECO

Marc Nézet
CSO & CDO
Nemetschek Group

Followed by a Keynote Discussion from 16:30 to 17:00 pm moderated by Dr. Philipp Gerbert, CEO TUM Venture Labs

Thursday, 12.09.2024 // 08:30 - 09:00

Creating value with AI: How to professionally apply AI

Dr. Andreas Liebl
CEO
appliedAI

Thursday, 12.09.2024 // 09:00 - 09:30

Real World Data as the Catalyst: Transformative Advances in AI

Dr. Matthias Standfest
CEO & Co-Founder
formfollows.ai by Drees&Sommer

08:30 Registration & Coffee

09:00 Opening Ceremony

Welcome Address

Prof. Dr. Thomas F. Hofmann, President Technical University Munich
Prof. Georg Nemetschek, Honorary Senator
Yves Padrines, CEO Nemetschek Group
Prof. Dr. Christoph Gehlen, Dean TUM School of Engineering and Design
Christian Bernreiter (rec.), Bavarian State Minister for Housing, Construction and Transport

Opening Keynote

How Human-Centric AI Shapes the Built World
Prof. Dr. Burcin Becerik-Gerber, University of Southern California (USC)

10:30 Coffee Break

11:00 Paper Session 1: *Digital Twins & AI*

Session Chair: Prof. Dr. Rafael Sacks, Technion Israel Institute of Technology, Israel

1. Artificial Intelligence For Automated Digital Twinning of Buildings
Mansour Mehranfar[1]; Dr. Alexander Braun[1]; Prof. Dr. André Borrmann[1]
[1] Technical University of Munich, Germany

2. Enriching Digital Replication of Buildings with Thermal Data
Manoj Kumar Biswanath[1]; Prof. Dr. Ludwig Hoegner[2]; Prof. Dr. Thomas Kolbe[3]
[1] Photogrammetry and Remote Sensing, Technical University of Munich, Germany
[2] Department of Geoinformatics, Munich University of Applied Sciences, Germany
[3] Chair of Geoinformatics, Technical University of Munich, Germany

3. Fusion of Component-Based Machine Learning and Digital Twins – the Case of Energy-Efficient Buildings
Prof. Dr. Philipp Geyer[1]
[1] Sustainable Building Systems Group, Leibniz University Hannover, Germany

4. A LIVING LAB: A Digital Twin for Design, Engineering and Sustainability
Prof. Dr. David Gerber[1]; Azam Khan[2]; Simon Breslav[2]; Nikolas McGlashan[3]
[1] University of Southern California, LA, United States of America
[2] Trax.co
[3] Massachusetts Institute of technology, MA, United States of America

5. AI-Driven Pedestrian and Evacuation Dynamics for the Built Environment
Patrick Berggold[1]; Ana Čukarska[2]; Dr. Stavros Nousias[1]; Prof. Dr. Felix Dietrich[2]; Prof. Dr. André Borrmann[1]
[1] School of Engineering and Design; Technical University of Munich, Germany
[2] School of Computation, Information and Technology; Technical University of Munich, Germany

6. Route Prediction for Mobility Data using Geometric Deep Learning
Dominik Fuchsgruber[1]; Victoria Dahmen[2]; Klaus Bogenberger[2]; Stephan Günnemann[1]
[1] Data Analytics and Machine Learning, Technical University of Munich, Germany
[2] Traffic Engineering and Control, Technical University of Munich, Germany

7. Evaluation of Probabilistic Digital Twins for the Construction of a Road Embankment
Dafydd Cotoarbă[1]; Prof. Dr. Daniel Straub[2]; Prof. Dr. Ian Smith[1]
[1] Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich, Germany
[2] Engineering Risk Analysis Group, Technical University of Munich, Germany

After all presentations there will be a 20 minute interactive question round and panel discussion

12:30 Lunch & Networking Break

13:30 **Research Keynote**

BIMKIT - An AI ecosystem for generating as-built models for buildings and infrastructure

Prof. Dr. Markus König, Ruhr University Bochum

Paper Session 2: *AI-based Decision Support*

Session Chair: Prof. Dr. Iva Kovacic, University of Technology Vienna, Austria

1. Explanation Strategies in Building-Design Support

Andre Yu-Li[1]; Prof. Dr. Frank Petzold[2]; Prof. Dr. Ian Smith[1]

[1] Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich, Germany

[2] Chair of Architectural Informatics, Technical University of Munich, Germany

2. Explainable Decision-Making Framework for Building Design Education

Shih-Pu Kuo[1]; Prof. Dr. Pierluigi D'Acunto[2]; Prof. Dr. Ian Smith[1]

[1] Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich, Germany

[2] Professorshp of Structural Design, Technical University of Munich, Germany

3. Towards Augmented Decision-Making using Complex Digital Twins

Dr. Ranjith Soman[1]

[1] Integral Design and Management Section, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Netherlands

4. Towards a Copilot in BIM Authoring Tool using a Large Language Model-Based Agent for Intelligent Human-Machine Interaction

Changyu Du[1]; Dr. Stavros Nousias[1]; Prof. Dr. André Borrmann[1]

[1] Chair of Computational Modeling and Simulation, Technical University of Munich, Germany

5. Integration of Large Language Models and Knowledge Graphs for Enhancement in Construction Planning

Akarsth Kumar Singh[1]; Prof. Dr. Shang-Hsien Hsieh[1]

[1] Department of Civil Engineering, National Taiwan University, Taiwan

6. Active Learning Surrogates for Enhanced Reliability Assessment of Engineering Systems

Omar Bouattour[1]; Dr. Oindrila Kanjilal[2]; Prof. Dr. Debarghya Ghoshdastidar[1]

[1] School of Computation, Information and Technology, Technical University of Munich, Germany

[2] Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich, Germany

7. Training and Prediction of Surrogate Models for Landscape Chalice-Shaped Columns Using Multi-objective Optimization and Machine Learning

Dr. Han Zhang[1]; Hang Dai[1]; Wenjing Ren[1]

[1] School of Architecture, Southeast University, China

8. AI-eXtended Design (AIXD): A Python Toolbox for Augmenting Parametric Design with Machine Learning

Kuhn, S. V.[1,2]; Kraus, M. A.[3], Salamanca, L.[2,4], Apolinarska, A. A.[2,5], Maissen, A.[4], Bischof, R.[4], Rust, R.[5], Casas, G.[5], Tatsis, K.[4], Kaufmann, W.[1,2], Kohler, M.[2,5], Pérez-Cruz, F.[4]

[1] Institute of Structural Engineering (IBK), ETH Zürich, Switzerland

[2] Centre for Augmented Computational Design in Architecture, Engineering, and Construction, ETH Zürich, Switzerland

[3] Institute of Structural Mechanics and Design (ISM+D), TU Darmstadt, Germany

[4] Swiss Data Science Center, ETH Zürich, Switzerland

[5] Gramazio Kohler Research, ETH Zürich, Switzerland

After all presentations there will be a 20 minute interactive question round and panel discussion

15:30 **Coffee Break**

11:00 **Paper Session 3:** *Natural Language Processing & Remote Perception*
Session Chair: Prof. Dr. Shang-Hsien (Patrick) Hsieh, National Taiwan University, Taiwan

1. Retrieval-Augmented Generative Language Model for Construction Safety Knowledge
Kilian Speiser[1]; Prof. Dr. Jochen Teizer[1]
[1] Department of Civil and Mechanical Engineering, Technical University of Denmark, Denmark

2. Building Defect Diagnosis and Treatment Recommendation using Graph-Enhanced Large Language Model
Dr. Kahyun Jeon[1]; Prof. Dr. Ghang Lee[1,2]
[1] Dept. of Architecture and Architectural Engineering, Yonsei University, Republic of Korea
[2] Technical University of Munich - Institute for Advanced Study, Germany

3. Integration of ML Services for a Visual Fire Safety Inspection Tool
Angelina Aziz[1]; Prof. Dr. Markus König[1]
[1] Department of Civil and Environmental Engineering, Ruhr University Bochum, Germany

4. LiDAR Data for Enriching Open Geospatial Building Datasets: Implications for Urban Building Energy Modeling
Silvia Vangelova[1]; Prof. Patrick Kastner[1]
[1] Sustainable Urban Systems Lab, Georgia Institute of Technology, GA, United States of America

5. Enhancing Monocular Height Estimation with Incomplete Labels for 3D Building Modeling from Single Remote Sensing Imagery
Sining Chen[1,2]; Prof. Xiao Xiang Zhu[1,2]
[1] Chair of Data Science in Earth Observation, Technical University of Munich, Germany
[2] Munich Center for Machine Learning, Germany

6. Towards Large-Scale Building Modeling with TomoSAR Point Clouds
Zhaiyu Chen[1;] Prof. Xiao Xiang Zhu[1,2]
[1] Chair of Data Science in Earth Observation, Technical University of Munich, Germany
[2] Munich Center for Machine Learning, Germany

7. Robotic Deconstruction of Brickwork Enabled by Deep Learning-Based Perception
Begüm Saral[1]; Hanzhi Chen[2]; Prof. Dr. Stefan Leutenegger[2]; Prof. Dr. Kathrin Dörfler[1]
[1] TT Professorship of Digital Fabrication, Technical University of Munich, Germany
[2] TT Professorship of Machine Learning for Robotics, Technical University of Munich, Germany

After all presentations there will be a 20 minute interactive question round and panel discussion

17:30 **Industry Session** *Artificial Intelligence at Work*
Intro by: Dr. Michael Klimke, baiosphere

Prof. Dr. Burcin Becerik-Gerber, USC
Furio Sordini, Implenia
Matthias Zühlke, syte
Michael Gisdol, Bayrische Hausbau
Yashar Moradi, MOD.construction

Moderation by: Tobias Förtsch, TUM Venture Lab Built Environment

18:30 **Recap and Closing**
Prof. Dr. Ian Smith, Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich

18:45 **Network & Reception**

Program Day 2 >>

08:00 Registration & Coffee

08:30 Research Keynote

Towards Physics-Informed Cities: Digital Twins

Prof. Francisco Chinesta, Arts et Metiers Institute of Technology (Paris)

09:00 Paper Session 4: *Physics-Informed AI*

Session Chair: Prof. Dr. Kathrin Dörfler, Technical University of Munich, Germany

1. A Proposed Ontology Network for AI-based Root Cause Analysis in Precast Supply Chains

Irfan Čustović[1]; Dr. Jianpeng Cao[1]; Dr. Ranjith Soman[2]; Dr. Pieter Pauwels[3]; Dr. Daniel Hall[1]

[1] Department of Management in the Built Environment, TU Delft, The Netherlands

[2] Department of Civil and Environmental Engineering, TU Delft, The Netherlands

[3] Department of the Built Environment, TU Eindhoven, The Netherlands

2. Evaluation of Methods for AI-Enabled Material Property Predictions

Julia Kaltenegger[1]; Dr. Ekaterina Petrova[1]; Prof. Dr. André Borrmann[2]; Dr. Pieter Pauwels[1]

[1] Department of the Built Environment, Eindhoven University of Technology, Netherlands

[2] Chair of Computational Modelling and Simulation, Technical University of Munich, Germany

3. SDF-PINNs: Joining Physics-Informed Neural Networks with Neural Implicit Geometry Representation

Prof. Dr. Michael Kraus[1]; Dr. Konstantinos Tatsis[2]

[1] Fachgebiet Baustatik, TU Darmstadt, Germany

[2] Swiss Data Science Center (SDSC), Zürich, Switzerland

4. Efficient Labelling of Air-Voids and Aggregates in Concrete and Mortar Using Confocal Laser Scanning Microscopy Combined with Meta AI's Segment Anything Model

Viktor Kostic[1]; Qadeer Khan[2,3]; Prof. Dr. Daniel Cremers[2,3]; Prof. Dr. Christoph Gehlen[1]; Dr. Jithender Timothy[1]; Dr. Thomas Kränkel[1]

[1] Chair of Materials Science and Testing, School of Engineering and Design, Technical University of Munich, Germany

[2] Computer Vision Group; School of Computation, Information and Technology, Technical University of Munich, Germany

[3] Munich Center for Machine Learning, Germany

5. Improving the Detection of Air-Voids and Aggregates in Images of Concrete Using Generative AI

Qadeer Khan[1,3]; Mahmoud Hassan[1]; Viktor Kostic[2]; Dr. Vladimir Golkov[1,3]; Prof. Dr. Christoph Gehlen[2]; Prof. Dr. Daniel Cremers[1,3]

[1] Chair of Computer Vision & Artificial Intelligence, Technical University of Munich, Germany

[2] Chair of Material Science & Testing, Technical University of Munich, Germany

[3] Munich Center for Machine Learning, Germany

6. Solving Wave Equations with Neural Networks

Qing Sun[1]; Divya Shyam Singh[2]; Leon Herrmann[2]; Prof. Dr. Stefan Kollmannsberger[3]; Prof. Dr. Felix Dietrich[1]

[1] School of Computation, Information and Technology, Technical University of Munich, Germany

[2] School of Engineering and Design, Technical University of Munich, Germany

[3] Chair of Data Science in Engineering, Bauhaus-Universität Weimar, Germany

7. Accelerating Full Waveform Inversion by Transfer Learning

Divya Shyam Singh[1]; Leon Herrmann[1]; Qing Sun[2]; Prof. Dr. Felix Dietrich[2]; Prof. Dr. Stefan Kollmannsberger[3]

[1] School of Engineering and Design, Technical University of Munich, Germany

[2] School of Computation, Information and Technology, Technical University of Munich, Germany

[3] Chair of Data Science in Engineering, Bauhaus-Universität Weimar, Germany

8. Uncertainty Analysis of Longitudinal Tunnel Performance through a Physics-Informed Neural Networks Embedded Bayesian Framework

Yelu Zhou[1,2]; Dr. Iason Papaioannou[1]; Prof. Dr. Daniel Straub[1]; Prof. Dr. Dongming Zhang[2]; Prof. Dr. Hongwei Huang[2]

[1] Engineering Risk Analysis Group, Technical University of Munich, Germany

[2] Key Laboratory of Geotechnical and Underground Engineering of Ministry of Education and Department of Geotechnical Engineering, Tongji University, China

10:30 Coffee Break

11:00 Paper Session 5: *Building Energy & Environment*

Session Chair: Prof. Dr. Carl Haas, University of Waterloo, Canada

1. Extracting Environmental Optimization Potentials from Material Passports for Design Support

Philipp Stauss[1]; Simon Berger[1]; Prof. Dr. Iva Kovacic[1]

[1] University of Technology Vienna, Austria

2. Measurement System Design to Improve Building Energy Retrofits

José Quesada Allerhand[1]; Thomas Auer[2]; Prof. Dr. Ian Smith[1]

[1] Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich, Germany

[2] Chair of Building Technology and Climate Responsive Design, Technical University of Munich, Germany

3. Understanding the Air Leakage through Windows based on Household's Socio-Economic Level

Hevar Palani[1], Dr. Aslihan Karatas[1]

[1] Department of Civil, Material, and Environmental Engineering; University of Illinois at Chicago, Chicago, IL, USA

4. A Comparative Study on the Urban Weather Generator: Is it Useful for Urban Decision-Makers?

Ze Yu Jiang[1]; Prof. Patrick Kastner[3]; Maryam Almaian[3]; Sofia Mujica[2]

[1] School of Computer Science, Georgia Tech, Atlanta, USA

[2] George W. Woodruff School of Mechanical Engineering, Georgia Tech, Atlanta, USA

[3] School of Architecture, Georgia Tech, Atlanta, GA, USA

5. Machine Learning to Simulate Interactions between Buildings and their Outdoor Conditions

Dr. Miguel Martin Fehlmann[1]; Prof. Mario Berges[2]; Prof. Jantien Stoter[1]; Dr. Clara Garcia-Sanchez[1]

[1] Delft University of Technology, Netherlands

[2] Carnegie Mellon University, PA, United States of America

6. Self-Supervised Learning Approaches to Improve Residential Housing Energy Prediction Accuracy

Valentin Kaufmann[1]; Pascal Mattia Esser[2]; Prof. Dr. rer. pol. Bing Zhu[1]; Prof. Dr. Debarghya Ghoshdastidar[2]

[1] School of Engineering and Design; Technical University of Munich, Germany

[2] School of Computation, Information and Technology; Technical University of Munich, Germany

7. Building Energy Efficiency Prediction and Uncertainty Quantification via Bayesian Neural Networks

Dr. Pablo G. Morato[1]; Anna Maria Koniari[1]; Dr. Seyran Khademi[1]; Dr. Charalampos P. Andriotis[1]

[1] Delft University of Technology, Netherlands

8. Building Energy Retrofit Planning through Markov Decision Processes

Anna Maria Koniari[1]; Dr. Pablo G. Morato[1]; Dr. Charalampos P. Andriotis[1]; Dr. Seyran Khademi[1]; Dr. Simona Bianchi[1]; Prof. Dr. Mauro Overend[1]

[1] Delft University of Technology, Netherlands

After all presentations there will be a 20 minute interactive question round and panel discussion

12:30 Lunch & Networking Break

13:30 Paper Session 6: *Infrastructure Planning and Maintenance*

Session Chair: Prof. Dr. Ghang Lee, Yonsei University, Republic of Korea

1. Cloud-Based Building Information Modeling (CBIM)
Dr. Zijian Wang[1]; Prof. Dr. Rafael Sacks[1]
[1] Technion Israel Institute of Technology, Israel

2. Connecting BIM to the Railway Intervention Planning Process
Steven Chuo[1]; Emma Zeindl[1]; Hamed Mehranfar[1]; Prof. Bryan Adey[1]
[1] Institute of Construction and Infrastructure Management, ETH Zürich, Switzerland

3. Synthetic Dataset for ML-Based Image-to-3D Reconstruction of Bridge Infrastructures
Mustafa Cem Gunes[1]; Lazlo Bleker[2]; Tao Sun[1]; Prof. Dr. Pierluigi D'Acunto[1,2]
[1] Professorship of Structural Design, Department of Architecture, School of Engineering and Design, Technical University of Munich, Germany
[2] Institute for Advanced Study, Technical University of Munich, Garching, Germany

4. Automatic Bridge Maintenance Strategy Generation Framework Based on Multimodal Neural Networks
Dr. Xiaofeng Zhu[1]; Dr. Ali Khudihair[1]; H. Song[2]; Prof. Haijiang Li[1]
[1] Cardiff University, UK
[2] Dalian Maritime University, China

5. Investigating Graph Based Deep Reinforcement Learning for Inspection and Maintenance Optimization
Daniel Hettegger[1]; Lisa Roßgoderer[1]; Daniel Koutas[1]; Prof. Dr.-Ing. habil. Alois Christian Knoll[1]; Prof. Dr. Daniel Straub[1]
[1] Technical University of Munich, Germany

6. Investigating Lag-Llama for Prognostics and Health Management
Daniel Koutas[1]; Daniel Hettegger[1]; Junbo Leng[1]; Prof. Dr. Daniel Straub[1]
[1] Technical University of Munich, Germany

7. A Methodology for Determining Optimal Component-Level Railway Intervention Programs
Hamed Mehranfar[1]; Prof. Bryan Adey[1]; Steven Chuo[1]
[1] Institute of Construction and Infrastructure Management, ETH Zurich, Switzerland

After all presentations there will be a 20 minute interactive question round and panel discussion

15:00 Coffee Break

15:30 Industry Keynote

From Lab to Market: Integration of AI Research into Real-World Applications
Dr. Angelika Kneidl, accu:rate

16:00 Industry Keynote

Responsible and sustainable AI within the AECO
Marc Nézet, Nemetschek Group

16:30 **Keynote Discussion**
Moderation by: Dr. Philipp Gerbert, TUM Venture Labs

Dr. Angelika Kneidl, accu:rate
Marc Nézet, Nemetschek Group

17:00 **Networking Break**

17:30 **Industry Session** *AI-enhanced Design & Construction*

Dr. Julia Reisinger, factorymaker
C. Lindner, Zaha Hadid Architects
C. Geiger, Zaha Hadid Architects
Stephan Lüttger, Max Bögl Windkraft AG

Moderation by: Dr. Christos Chantzaras, TUM Venture Lab Built Environment

18:30 **Recap and Closing**
Prof. Dr. Ian Smith, Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich

19:00 **Conference Dinner**

An additional ticket is required to attend the Conference Dinner.

Location: Gasthof Neuwirt
www.gasthof-neuwirt.org
Münchener Str.10
85748 Garching

Program Day 3 >>

08:00 Registration & Coffee

08:30 Industry Keynote

Creating value with AI: How to professionally apply AI
Dr. Andreas Liebl, applied AI

09:00 Industry Keynote

Real World Data as the Catalyst: Transformative Advances in AI
Dr. Matthias Standfest, Drees & Sommer

09:30 Research Keynote

AI in the Built Environment: The Application-Driven Perspective
Prof. Dr. André Borrmann, Technical University of Munich

10:00 Keynote Discussion

Moderated by: Dr. Christos Chantzaras, Tobias Förtsch, TUM Venture Labs

Dr. Andreas Liebl, applied AI
Dr. Matthias Standfest, Drees&Sommer
Prof. Dr. André Borrmann, Technical University of Munich

10:30 Coffee Break

11:00 Start-Up Pitch Session

moderated by: Artem Kuchukov, KEWAZO

Spacio.	Franz Forsberg
Twinovia	Stefan Fellner
Factorymaker	Thomas Reisinger
Zenesis	Gilles Dostert
Monco.ai	Victor Dzhagatspanyan
Alago	Janick Hofer
Focused ai	Jonas Mühlbauer
ESG-X	Valentin Aman
EMIDAT	Jona Roßmann

12:30 Lunch & Networking Break

13:30 Paper Session 7: *Semantic Model Generation*

Session Chair: Prof. Dr. Philipp Geyer, Leibniz University Hannover, Germany

1. RichVoxel as a Common Data Representation Format for Checking Consistency between 3D Representations Having Varying Geometry and Semantics

Medhini Heeramaglore[1]; Prof. Dr. Thomas Kolbe[1]

[1] *Chair of Geoinformatics, School of Engineering and Design, Technical University of Munich, Germany*

2. Reconstructing LOD3 Building Models Using Mobile Laser Scanning and Machine Learning

Olaf Wysocki[1]; Prof. Dr. Christoph Holst[2]

[1] Professorship of Photogrammetry and Remote Sensing, School of Engineering and Design, Technical University of Munich, Germany

[2] Chair of Engineering Geodesy, School of Engineering and Design, Technical University of Munich, Germany

3. Enhancement of "ZM-I Digitales Bauwerksbuch" – Automated Building Inspection and Monitoring via Digital Twins, Deep Learning and Extended Reality

Dr. Christian Mühlbauer[1]; Dr. Christian Stettner[1]; Dr. Andé Müller[1,2]; Prof. Dr. Michael Kraus[2,3]

[1] ZM-I München GmbH, Germany

[2] ZM-I KI GmbH, Germany

[3] Institute of Structural Mechanics and Design (ISM+D), TU Darmstadt, Germany

4. Semantically Loaded Point Clouds in Virtual Reality

Emmanouil Katsimpalis[1]; Daniel Lopez Morales[1]; Prof. Bryan Adey[2]; Prof. Dr. Carl Haas[1]

[1] Department of Civil and Environmental Engineering, University of Waterloo, Canada

[2] Department of Civil, Environmental and Geomatic Engineering, ETH Zürich, Switzerland

5. Employing Graph Neural Networks for Construction Drawing Content

Andrea Carrara[1]; Dr. Stavros Nousias[1]; Prof. Dr. André Borrmann[1]

[1] Chair of Computational Modeling and Simulation, Technical University of Munich, Germany

6. Generating Façade Segmentation Datasets using Diffusion Models

Alejandro Rueda Segura[1]; Dr.-Ing Yao Sun[2]; Prof. Dr. Frank Petzold[1]

[1] Architectural Informatics, Technical University Munich, Germany

[2] Data Science in Earth Observation, Technical University Munich, Germany

7. A Two-Step Method to Reconstruct 3D BIM Models Based on 2D CAD Drawings

Xing Liang[1]; Prof. Nobuyoshi Yabuki[1]; Prof. Tomohiro Fukuda[1]

[1] Division of Sustainable Energy and Environmental Engineering, Osaka University, Osaka, Japan

8. BIM Data Extraction and Geometry Interpretation Using Visual Scripting

Valentinas Petrinas[1]; Stefan Schützenhofer[1]; Anastasia Wieser[1]; Robin Jakoubek[2]; Prof. Dr. Iva Kovacic[1]

[1] Department of Integrated Planning and Industrial Building, TU Wien, Austria

[2] Eisler ZT GmbH, Wien, Austria

After all presentations there will be a 20 minute interactive question round and panel discussion

15:00 Coffee Break

15:30 Award Ceremony: Best Paper, Best Start-Up Award

The best paper award is presented by Prof. Dr. Ian Smith, Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich

The best startup award is presented by Andreas Preisser, baiosphere - the Bavarian AI network, Munich

16:00 Recap & Closing

Prof. Dr. Ian Smith, Georg Nemetschek Institute Artificial Intelligence for the Built World, Technical University of Munich

16:30 Farewell & Drinks

Information

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Wi-Fi name (SSID): mwn-events
Username: GNISymposium
Password: s1a4V9iG

Configuration profiles for wireless network access are available via the QR code (follow the link mwn-events). Access to this site is available via the open Wi-Fi (the SSID) lrz.

Getting around

All symposium venues are easily reachable by public transport.

Munich has an excellent multi-modal public transport system, including buses, trams, the U-Bahn (subway), and the S-Bahn (suburban trains). Details on the zones, tickets, tariffs, and transportation maps are available from the MVV and MVG (local transport authority) websites and apps. Disruptions and changes are announced regularly on these channels, at stations, and in vehicles.

Tickets can be purchased according to zones at stations, in trams and buses, or as a mobile ticket from the DB, MVV, or MVG apps.

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