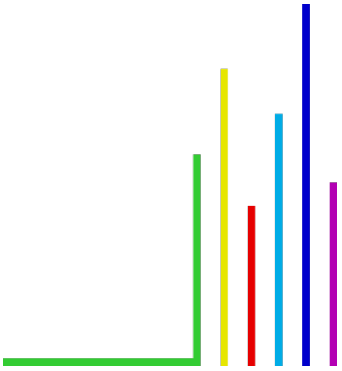

LDAC2024
12th Linked Data in Architecture and Construction Workshop

Proceedings of the 12th Linked Data in Architecture and Construction Workshop (LDAC 2024)

Bochum, Germany, June 13-14, 2024

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Preface

The LDAC workshop series provides a focused overview on technical and applied research regarding the usage of semantic web, linked data and web of data technologies for architecture and construction (design, engineering, construction, operation, etc.). The workshop aims at gathering researchers, industry stakeholders, and standardization bodies of the broader Linked Building Data (LBD) community. The aim of the workshop is to present current developments in research and development, coordinate efforts, gather stakeholders, and extend industry uptake and collaboration.

We are pleased to collect in this volume the papers that were submitted and presented during the 12th Linked Data in Architecture and Construction (LDAC) Workshop. The workshop took place on 13 and 14 June 2024, as a stand-alone event in Bochum, Germany. The workshop was preceded by an extensive 3-day summer school. These proceedings present the eleven full papers and two short papers that were accepted after the peer-reviews by the members in the program committee.

The workshop also included three excellent keynotes on three diverse topics, one of them hosted during the SSoLDAC Summer School. The first keynote, by Ekaterina Petrova (TU Eindhoven) was titled “Symbolic, Neural or Neuro-Symbolic Artificial Intelligence for Architecture, Engineering and Construction?”.

Embedding intelligence in Artificial Intelligence (AI) systems requires enabling both the analysis of vast amounts of raw data and the use of background knowledge to perform higher-level functions such as abstraction, analogy, reasoning, and planning. While sub-symbolic (i.e., neural) AI approaches such as Artificial Neural Networks are powerful when it comes to processing data and discovering patterns in it, they are usually data-hungry and lack explicit representations of background knowledge. Symbolic structures, on the other hand, represent this background knowledge explicitly (e.g., semantic graphs). Neuro-symbolic AI blends the processing and approximation capabilities of neural methods with the knowledge representation and reasoning abilities of symbolic approaches to improve the overall performance of AI systems and address challenges at both algorithm and application levels. This talk will discuss the untapped potential of neuro-symbolic AI in Architecture, Engineering and Construction and highlight recent implementations and ongoing research aimed at improving the performance of the built environment, focusing particularly on smart building applications.

The second keynote was given by Raúl García-Castro (Universidad Politécnica de Madrid), with the title “Lessons learnt from researching on semantic interoperability”.

Seamless interoperability is still a challenge in the current landscape of information systems, which need to be aware of cross-sectorial information coming not only from other information systems but also from people or diverse entities in the world. This talk presents some lessons learnt from researching and implementing semantic interoperability. On the one hand, it will cover the semantic aspect of interoperability, giving guidelines on the development of ontologies and on their role for sharing consensus. On the other hand, it will deal with the interoperability perspective, giving hints on engineering semantically interoperable systems and presenting challenges in decentralised interoperability, such as the privacy one.

The third and last keynote was presented by Martin Voigt (elevait GmbH), with the title "Overcoming boundaries: How Linked Data and Machine Learning are Transforming Enterprise Software".

In a world driven by data, the ability to effectively structure, process and utilize information is more crucial than ever. However, traditional enterprise software and its technological paradigms often reach their limits. In this keynote, we outline how the elevait suite pushes the boundaries of traditional data processing by applying linked data principles and machine learning. Our platform is domain and use case agnostic, but is widely used in the construction industry to automate business processes and increase efficiency. Learn how we use advanced workflows to semantically annotate data, train ML models and generate data according to linked data principles and use it in process automation. We also show how no-code tools are used to define business rules and how automatically generated user interfaces make it easier to interact with this data. Using concrete examples from our platform, we will demonstrate how these technologies are implemented in real-life scenarios to create precise, scalable and efficient solutions. We will also share valuable lessons learned that can help you drive your development and research projects forward.

In the event, we also had a full industry marketplace, as well as a number of posters. These posters have not been included in this Proceedings volume, yet are available via the LDAC workshop website[1]. The list of posters presented in the event is:

- Lasitha Chamari, Shalika Walker, Ekaterina Petrova, Pieter Pauwels. *Linked Data Service for Improving Portability of a Model Predictive Controller*.
- Sebastian Blechmann, Hannah Görigk, Rita Streblow and Dirk Müller. *Ontology-based approach for fault detection and diagnosis and fault location assessment in air handling units.*
- Pille-Riin Peet, Ergo Pikas and Aime Ruus. *Semantic Web for Streamlining Building Design and Permitting Processes.*
- Julia Kaltenegger, Ekaterina Petrova, André Borrmann and Pieter Pauwels. *A conceptual system architecture for enriching Digital Twins with material performance data using symbolic and sub-symbolic Artificial Intelligence.*

[1] https://linkedbuildingdata.net/ldac2024/

- Lu Wan, Ferdinand Rossa, Torsten Welfonder, Ekaterina Petrova and Pieter Pauwels. *A web application for automated building energy analyses and monitoring using semantic web technologies.*
- Sergio Acero González, James Allan, Hashem Birahjakli, Emanuele Laurenzi, Wolfram Willuhn, Edrisi Munoz and Sascha Stoller. *The development of an application layer connected to a knowledge graph for the continuous calculation of energy performance indicators.*
- Zehor Hounas, Maxime Lefrançois, Antoine Zimmermann and Bruno Traverson. *A hybrid approach of semantic modeling and co-simulation for a better consideration of the physics of physical phenomena in a smart building.*
- Jonas Maibaum and Philipp Hagedorn. *Knowledge modeling and provision for circular economy aspects of municipal infrastructure projects.*
- Daniel Napps. *Knowledge Graphs for Building Design Decisions.*

Acknowledgments

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Special thanks go to the sponsors of this workshop, with Pallas and Tennet as diamond sponsors, elevait, Neanex, and Building Digital Twin Association (BDTA) as gold sponsors, and bSDD, BimConnected, Schüßler-Plan digital, XRtech, NMBU, and QAECY as silver sponsor.

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