Preface for The Third International Workshop on Semantics in Dataspaces (SDS 2025)

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Dataspaces have emerged as ecosystems that facilitate seamless and trusted data sharing, and they have recently attracted growing interest from policymakers, researchers, and practitioners alike. This rising attention is driven in part by regulatory developments such as the European Data Governance Act (DGA), which has boosted the visibility and relevance of dataspaces, particularly, though not exclusively, in Europe. The DGA defines terms such as data and service providers, and is a regulation aimed at promoting fair and equitable data use and establishing a framework for data governance within the EU. Moreover, it aims to increase trust in data sharing, expand the availability of data for reuse, encourage the development of common dataspaces, and promote the use of data for good. The DGA will impact various sectors, including data providers, researchers, businesses and citizens. Other examples include the movement to establish national and international research data management infrastructures, such as the European Open Science Cloud, the NFDI, and others. The growing adoption of the FAIR Data Principles, originally introduced by the semantics community, is playing a key role in shaping the development of national and international dataspaces. These principles, which emphasize that data should be Findable, Accessible, Interoperable, and Reusable, align closely with the objectives of dataspaces to enable effective and trustworthy cross-organizational data sharing. For example, the European Union is investing between 4 and 6 billion euros to establish sector-specific dataspaces and has explicitly required that they adhere to the FAIR Principles. Implementing these principles at scale, however, demands more than policy. It requires robust technical foundations, particularly in the area of semantic interoperability. This is where the Semantic Web community can offer critical expertise, drawing on decades of experience in developing RDF-based standards and solutions. As such, dataspaces

represent a significant and timely opportunity for the Semantic Web community, with the potential to drive innovation across a wide range of application domains.

The Semantics in Dataspaces (SDS) workshop series aims to foster collaborative efforts to develop semantic methods and solutions tailored for dataspaces. The workshop series focuses on improving the expressiveness and standardization of semantic methods and solutions for dataspaces, facilitate the development of shared semantic resources for dataspaces, explore the integration of semantic technologies into dataspace architectures, and promote the adoption of semantic approaches in dataspace implementations. The SDS workshop also serves as a platform to bring together a diverse community of researchers and practitioners in this area. It is highly interactive and communicative, with formal presentations as well as extensive discussions. Especially through engaging discussions and collaborative efforts, the workshop aims to advance the state of the art for semantics in dataspaces.

SDS 2025 Edition

The Third International Workshop on Semantics in Dataspaces continues the success of its previous editions [1, 2, 3]. The workshop brought together people interested in dataspaces or the role of semantics in them, from different communities such as dataspace drivers, legal and policy makers, as well as researchers from the Semantic Web community. Since members of these different communities rarely have the opportunity to interact with each other, we designed the workshop to be highly interactive and communicative. This year's keynote, presented by Anikó Gerencsér, was titled *Supporting Dataspaces through EU Vocabularies: Tools, Challenges, and Collaborative Solutions* and it drove discussions in line with the work of the Publications Office of the European Union. This full-day workshop consisted of formal paper presentations with fruitful Q&A sessions, and an open discussion that allows participants to identify promising topics for collaboration and follow-up activities.

The topics of interest in this workshop are threefold: First, a conceptual perspective highlights definitions of dataspaces, their core elements, and lifecycles. Participants examine formal models, the impact and potential of unique identifiers, and conceptual reusable assets in general. Second, state-of-the-art implementations in both academia and adoption are reviewed. This includes comparisons of current dataspace efforts and analyses of their requirements, key drivers, and common sustainable elements and standards. Last but not least, this workshop especially focuses on advancing the application of semantics for dataspaces. Participants evaluate the potential of semantic-based methods and solutions for dataspaces, and discuss the tailored benefits of ontologies and semantic models, unique identifiers, algorithms, the role of artificial intelligence and large language models, and concepts for a widespread dataspace adoption in the future.

With more than a dozen contributions and around thirty participants, the third SDS workshop presented many challenges, but also opportunities that will enhance the potential of dataspaces and lead to future global solutions. As workshop organizers, we are excited to strengthen the role of semantics for dataspaces and are confident that this workshop provided a stimulating and engaging forum for researchers and practitioners working in this area.

In this workshop edition, 19 papers were submitted for peer review. Of these, 13 papers were accepted for this volume, 4 as regular papers and 9 as short papers:

- Ontology-Driven eMobility Booking Management in the Energy Data Space [4]
- Flemish Health Data Space - Implementation Technical Overview and Challenges [5]
- Smart City Urban Heat Monitoring using a Solid-based Dataspace [6]
- Leveraging Query Decomposition for Scalable SPARQL Materialization in Dataspaces [7]
- piveau-X - A Compliance-Focused Semantic Web-based Catalog for Data Spaces [8]
- Federated Vocabulary Hubs as a Foundation for Semantic Layers in Data Spaces [9]
- GC-DAM - Graph and Contextual Embeddings for Heterogeneous Data Asset Matching [10]
- Towards interconnected dataspaces - implementing decentralised identity management via DAPS [11]

- Towards using the Solid Protocol for Data Transport in International Data Spaces (IDS) [12]
- Towards Semantics and Protocols for Contract Conclusion via the Web Architecture - A Gap Analysis [13]
- The Synergy of Large Language Models and Dataspaces - A Functional Exploration [14]
- Exploring Human Usability Challenges in Dataspaces [15]
- Representing Knowledge in Dataspaces [16]

The SDS chairs would like to thank all authors for submitting their papers, the members of the program committee for their thorough and detailed reviews, the presenters for their exciting talks, and the numerous participants for the great discussions during the workshop. In the open discussion session, the participants again confirmed to use the term *dataspace* in one word instead of *data space*. This emphasizes the role of dataspaces as a concept and research area, rather than just a space with data, similar to how *database* was coined earlier. During this discussion session, participants also discussed the dataspace challenges[1], which have been created and discussed by members of the *W3C Dataspaces Community Group*[2] since the last workshop edition. The formed consensus and joint decisions on these challenges will soon be reflected on the respective issues on GitHub and thus enable a clear, continuous collaboration on relevant topics in the scope of dataspaces. The discussed GitHub issues include: Pipelining workflows across participants, data discovery, interoperable policy engines, end-user confidence in data integrity, actual semantics in dataspaces, the scope of the community group, representing knowledge in dataspaces, conceptual relation between dataspace components, federated vocabulary hubs, and the handling of use cases.

We look forward to seeing everyone again at a future SDS workshop.

Program Committee (Alphabetical Order)

- Adamantios Koumpis, University of Cologne, Germany
- Aiara Lobo Gomes, Maastricht University, The Netherlands
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[1] https://github.com/w3c-cg/dataspaces/issues
[2] https://www.w3.org/community/dataspaces/

Declaration on Generative AI

The authors did not use generative artificial intelligence in the writing of this paper.

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