# Knowledge Graphs

##### Session 2.5 (SEMANTiCS)

#### Time: Thursday, September 21, 2023 - 16:45 to 18:00

#### Chair: Maribel Acosta, TUM School of Computation, Information and Technology

#### **Talks**

### Towards a Versatile Terminology Service for Empowering FAIR Research Data: Enabling Ontology Discovery, Design, Curation, and Utilization Across Scientific Communities

Purpose: We present a versatile Terminology Service (TS) designed for discovery and provision of ontologies, but also their design, curation and utilization. Our work is embedded in the roadmap of the National Research Data Infrastructure (NFDI) to support all major steps in research data life cycles by generating FAIR semantic artifacts. To fully unlock the potential of data, it must be made machine-actionable and semantically enriched. We present the TS, its user-driven development in conjunction with a use case of an ontology design process.

Methodology: Utilizing a user-centric methodology, we devised a TS that accommodates diverse use cases from multiple scientific communities. A major focus was on a balanced implementation of service-to-service features and usability of human interfaces providing rich functionalities for all stakeholders. By engaging domain experts, knowledge workers, and ontology engineers, we facilitated a collaborative ontology design process. This involved the application and evaluation of the TS, along with supplementary tools, workflows, and collaboration models.

Findings: We demonstrate the feasibility, prerequisites, and ongoing challenges associated with developing TS that encompass numerous aspects of ontology utilization to produce FAIR, machine-actionable data. A robust API facilitates ontology integration into research data infrastructures, promoting semantic enrichment and data harmonization across various workflows. GUIs must cater to diverse needs, from domain experts to ontology engineers, for ontology design and curation. We observed the demand for tools offering comprehensive views across disciplines and their ontologies, highlighting the importance of harmonization and alignment with common upper-level ontologies.

Value: Ontologies are the cornerstone to generate semantically rich, FAIR research data. TS which support different tasks of ontology design, curation, discovery, provision and utilization across scientific disciplines gain importance. Such services provide unified access to a large number of ontologies fostering their reuse, improvement, and maturation of ontologies. This paper demonstrates the various stakeholders to be considered, their requirements and utilization of a TS with use-cases from ontology curation and design from scientific community perspective.

| Philip StrömertTIB |
| --- |

### Knowledge graphs, semantic metadata and LLMs at work for marketing content [SP]

In this presentation you will learn how knowledge graphs combined with semantic metadata can enhance LLMs for better content discovery, understanding and question-answering. Join Ontotext’s Solutions Architect, Krasimira Bozhanova and Semantic Content Manager, Teodora Petkova, to discover how these innovative approaches were employed at Ontotext to elevate the value of the marketing content we produce and unlock the potential for powerful knowledge-driven insights.

During this talk you will learn about:

* Automated tagging of documents using custom and public vocabularies
* Wordpress integration of JSON-LD to use the tagging for visibility
* Integration with large language models (LLMs) to ask questions based on own content

| Krasimira BozhanovaOntotext[Affiliation page](https://www.ontotext.com/) | Krasimira Bozhanova has been with Ontotext for over 7 years. Krasi's experience as a developer and now Solutions Architect has helped Ontotext hit important milestones as GraphDB has evolved. |
| --- | --- |
| Teodora PetkovaOntotext[Affiliation page](https://www.ontotext.com/) | Teodora Petkova joined Ontotext 8+ years ago. Teodora is a well-seasoned semantic content manager, writer and published author in the space. |

### Native Execution of GraphQL Queries over RDF Graphs Using Multi-way Joins

Purpose: The query language GraphQL has gained significant traction in recent years.

In particular, it has recently gained the attention of the semantic web and graph database communities and is now often used as a means to query knowledge graphs.

Most of the storage solutions that support GraphQL rely on a translation layer to map the said language to another query language that they support natively, for example SPARQL.

Methodology: Our main innovation is a multi-way left-join algorithm inspired by worst-case optimal multi-way join algorithms. This novel algorithms enables the native execution of GraphQL queries over RDF knowledge graphs.

We evaluate our approach in two settings using the LinGBM benchmark generator.

Findings: The experimental results suggest that our solution outperforms the state-of-the-art graph storage solution for GraphQL with respect to both query runtimes and scalability.

Value: Our solution is implemented in an open-sourced triple store, and is intended to advance the development of representation-agnostic storage solutions for knowledge graphs.

| Nikolaos KaralisData Science group (DICE) |
| --- |

### 