Master Thesis

FIZ Karlsruhe
Leibniz Institute for Information Infrastructure

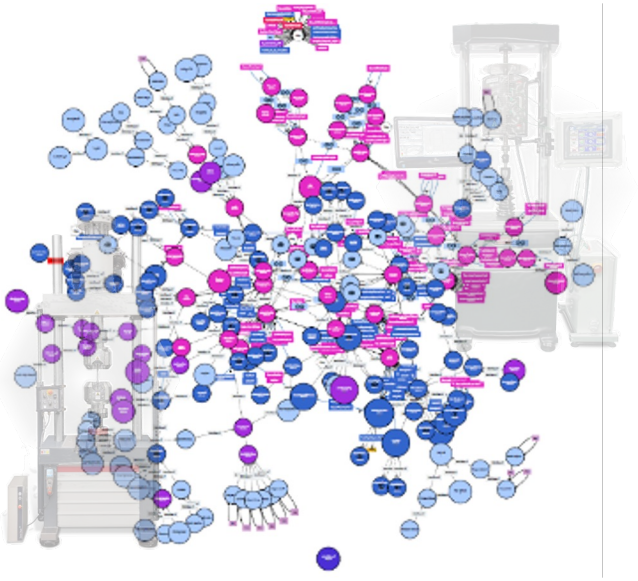
Ontologies for Materials Mechanical Testing

(Use case: Creep Testing Ontology)

NFDI MatWerk and the **Platform MaterialDigital (PMD)** are two leading German initiatives driving the digital transformation of materials science and engineering. Within the context of their ontology development efforts, this thesis proposes the creation of an application-level ontology for creep testing, based on the NFDI MatWerk Ontology (MWO) and the Platform Material Digital Core Ontology (PMDco). The ontology will be structured according to BFO2020 principles, ensuring semantic clarity and promoting interoperability with other ontologies across the NFDI ecosystem. By using real-world creep testing data from publicly available reference datasets, the student will produce a usable and understandable ontology-driven use case tailored to the needs of the NFDI MatWerk community. The project will also explore how the results can be extended to other mechanical testing datasets, contributing to the semantic alignment of existing tensile, fatigue, and hardness ontologies.

Tasks

- Analyze creep testing structure and parameters using reference datasets, including metadata.
- Develop an application-level ontology with MWO and PMDco under BFO2020.
- Annotate datasets and generate RDF triples for demonstration and validation.
- Assess extensibility to other mechanical tests and suggest ontology improvements.
- Document the work and prepare presentation materials for NFDI MatWerk.



Relevant literature, links and other resources

Several application-level ontologies were already developed for mechanical testing methods like tensile, fatigue, hardness, and stress relaxation tests. The project will also offer networking with NFDI-MatWerk and PMD.

MATERIALDIGITAL

NFDI MatWerk

This thesis will be supervised by **Prof. Dr. Harald Sack, Information Service Engineering at Institute AIFB, KIT, in collaboration with FIZ Karlsruhe**.

Which prerequisites should you have?

- Interest in ontologies and knowledge graphs
- Interest in research data management
- Interdisciplinary research mindset
- Team player with good communication skills

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